DOCUMENT RESUME

ED 291 714 SP 029 950

TITLE The President's Council on Physical Fitness and Sports 1985. National School Population Fitness Survey.
INSTITUTION President's Council on Physical Fitness and Sports, Washington, D.C.
PUB DATE 86
NOTE 107p.
PUB TYPE Reports - Research/Technical (143)

EDRS PRICE MF01/PC05 Plus Postage.
DESCRIPTORS *Adolescents; *Children; *Comparative Analysis; Elementary Secondary Education; Exercise; National Surveys; Physical Education; *Physical Fitness; Research Methodology; Sex Differences

ABSTRACT

Results from a national survey of the physical fitness of the nation's school children are presented in this monograph. The research was conducted to: (1) assess the physical fitness status of American public school children and youth ages 6-17, and establish national norms for this age group by sex and age, in 5 percent increments; (2) compare these data with the results of three similar national studies completed in 1958, 1965, and 1975; and (3) review and modify, if necessary, standards for the President's Council on Physical Fitness and Sports "Presidential Physical Fitness Award" for school children. A national probability sample of 18,857 public school children in grades 1-12 was selected, resulting in data from 9,678 boys and 9,179 girls from 32 states, 52 school districts, and 161 schools. These children and youth were randomly administered six tests of physical fitness from a battery of nine tests. The data were collected and analyzed and conclusions were made. Statistical data are presented in tables. (JD)

The President's Council On Physical Fitness and Sports 1985

National School Population Fitness Survey

THE PRESIDENT'S COUNCIL ON PHYSICAL FITNESS AND SPORTS 1985 NATIONAL SCHOOL POPULATION FITNESS SURVEY

Guy G. Reiff Ph D , The University of Michigan

W R. Dixon, Ph.D , The University of Michigan

Diane Jacoby, M.S., The University of Michigan

Guo Xiong Ye, M.S., Institute for Physical Education, Wuhan University, China

Christine G. Spain, M A., President's Council on Physical Fitness and Sports

Paul A Hunsicker, Ph D. (dec), The University of Michigan

HHS-OFFICE OF THE ASSISTANT SECRETARY FOR HEALTH
Research Project 282-84-0086
The University of Michigan, 1986

UNEDITED

ACKNOWLEDGMENTS

A large measure of appreciation is extended to The President's Council on Physical Fitness and Sports, not only for their foresight and enthusiasm for financing this survey, but their sincere cooperation and support during its inception, data collection and analysis. We particularly thank Dr Ash Hayes, Executive Director of the Council, and Ms. Christine Spain, Project Officer for the study, whose contributions were deeply appreciated and welcomed, and who both went far and beyond the call of duty in bringing this project to its completion And special thanks go to Ms. Shirley Dyson for her tireless effort and unfailing good humor in the struggle to get this manuscript to press.

The American Alliance for Health, Physical Education, Recreation and Dance also contributed their expertise; their generosity in providing fitness manuals and other materials for school personnel is deeply appreciated We would like to thank Dr. Ray Ciszek of the Alliance, in particular, for his suggestions and support

And finally, some personal acknowledgments to colleagues and other professionals, whose help and counsel is gratefully noted To Mr. Lou Mozzini, retired Coordinator of Health and Physical Education, San Diego County Schools, for his invaluable assistance in completing the Los Angeles-San Diego SMSA; to Mrs Joleen Graf, Houston, Texas, for her assistance in Texas, to Mr. Edwin Johnson, Daly City, Calif., for his heroic efforts in getting the Bay Area completed, to Mr. Larry McDonald, State Director, North Carolina, for his devotion to detail and cooperativeness in North Carolina; to Mr. Ron Wilson, Director, Division of Epidemiology and Health Promotion, NCHS, for his thorough review of the final report and his excellent and helpful comments; to Ms Kitti Aseltine whose cheerful demeanor and accurate word processing skills greatly enhanced this report; to Ms Sandy Seidel, from our University of Michigan staff for her voluntary assistance in proofreading and data analysis; and especially, to all of the physical education teachers for their commitment to youth fitness and the State and City Directors of Physical Education whose efforts in securing the cooperation of schools in their states will never be forgotten, and without which this survey could not have been completed

TO ALL, AGAIN, A PROFOUND AND SINCERE THANK YOU!

A data tape and documentation for the PCPFS 1985 National School Population Fitness Survey may be obtained by writing to. Dr Guy Reiff, Professor, Department of Physical Education, University of Michigan, 401 Washtenaw Avenue, Ann Arbor, Michigan 48109 A check or purchase order must be made out to the University of Michigan The cost is $100 00

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDICES

CHAPTER 1

Introduction

1.1 *Overview.* Three national studies of youth fitness and recent fitness test results have all revealed that children in the United States are under-exercised, at least as regards activities demanding vigorous exertion (19, 20, 21). The problems of physical fitness in youth are by no means new to this generation Statements deploring the lack of fitness originated during the colonial period of American history and have persisted through modern times

Another source of increased national interest in physical fitness in recent years has been data which directly relate high levels of physical activity to decreased rates of illness and morbidity This had nurtured a dramatic change from the "fitness for fitness sake" philosophy and emphasized the importance to one's health of maintaining at least a minimum level of physical fitness throughout life. Assistant Secretary for Health, Robert E. Windom, M.D. at a President's Council on Physical Fitness and Sports Council Meeting on September 12, 1986, stated "I know that you all are aware of the importance of exercise as much or more than I am...our message has to be clear that exercise is a very important part of maintaining the balance of good health, and we all will benefit longer, with good life styles as a result of it."

In addition to the generally supported premise that adequate and appropriate exercise and physical fitness minimizes the risk of some health problems, the commonly promoted view of professionals in physical education, sports medicine, exercise science, and other fitness professions is that physical fitness is a state of well-being which contributes to an individual's ability to perform everyday activities with vigor; and establishes a base for participation in various physical activities such as work, household responsibilities, sport and dance.

Considerable emphasis on physical education in the schools, physical fitness levels among school children, as measured by various tests, have not significantly increased (20, 21, 35) Various reasons for this failure have been proposed Some blame the affluence of the American lifestyle and the abundance of labor saving devices, others point to television and other forms of passive entertainment which compete with vigorous activity for children's time Others believe that the schools have simply failed to teach students that regular habits of participating vigorously in physical activities are vital to both immediate and remote concerns (e.g., looking good and staying healthy) of the children (35)

Other popular reasons include different educational priorities, staff layoffs, use of physical education as a "dumping ground" for students not otherwise occupied, and outdated, or outmoded, facilities and equipment. Although there are many excellent programs, some seem to have abandoned a basic educational mission and have become slightly more than supervised recess periods (35) Whatever the causes may be, it is reasonably clear that programs of physical education, which should and could establish habits of fitness have not done so for many Obviously, these deficiencies have far reaching implications for the nation's health and vigor.

Let us emphasize that "physical fitness" traditionally has been in the domain of physical education programs in the schools. Yet the overall findings of national fitness studies have either disclosed a decline or lack of improvement, based on very simple physical fitness tests. We are not proposing that the results from these simple tests should increase dramatically year after year What we are emphasizing is that the present performance levels for all tests leave room for a great deal of improvement, to say nothing of the scores in the lower percentiles.

Let us now reflect on a few facts The United States has more physical educators, more health educators, more gymnasia, more swimming pools, and more recreational opportunities than any country in the world Buttress t with the best medical science system in the world, not only in quality of care, but in medical resea equipment, facilities, and the like Yet we lead the world in degenerative

diseases. Joseph Califano, former Secretary of Health, Education and Welfare, speaking to the Institute of Medicine, National Academy of Science (1980) noted that " . some 29,000,000 adolescents are in poor physical condition . . . We need better preventive emphasis through exercise to prevent latent disorders " (35)

Medical authorities have urged schools to provide regular programs in circulatory and endurance activities for all children, kindergarten through grade 12, and suggested that the cardiovascular system should be stressed at least 30 minutes a day through vigorous activity Where this is not provided, children can progressively decondition, resulting in alarmingly poor cardiac condition.

Recent research has documented that heart disease can also be a pediatric problem Risk factors which can lead to coronary heart disease, namely obesity, elevated blood pressure and serum cholesterol, have been found in several studies in some 50 percent of the children in grades K-3 (14). Exercise can reduce these factors when the intensity and duration of the exercise is sufficient

It seems reasonable to conclude that, both increased attention to the development and maintenance of physical fitness, and a standardized testing system which can monitor and assess current levels of fitness, is needed in the public schools. Specifically, *The Surgeon General's Report on Health Promotion and Disease Prevention* (17) had identified physical fitness and exercise as areas for specific attention during the 1980's, and listed 12 major objectives to be achieved by 1990. This proposal was designed to meet two of those objectives, (1) to provide a methodology for systematically assessing the physical fitness of children, and, (2) to provide data for regular monitoring of national trends

1.2 *Scope*. The population defined for this research was school children (boys and girls) in the United States, ages 6 through 17, in the public schools. Students attending private or parochial schools, corrective institutions, or special schools (such as for the mentally or physically handicapped) were not included.

It is also important to note that the population defined reflected children who were enrolled in physical education classes; an insignificant number were not (most of these were in grades 11 and 12). The 1958, 1965 and 1975 studies utilized the same protocol. The 1975 study, however, sampled physical education classes where it was required of all children to enroll, and where not required, homerooms were sampled. We found it practically impossible in this study to sample homerooms. Many states had adopted restrictions to using part of the school day for outside activities such as athletics, physical education, extra-curricular events, etc. Thus this sample, for the most part, represents children who were enrolled in physical education classes. There were some exceptions where teachers were able to get 11th and 12th grade students to do the tests after the school day, but these occasions were rare Since the 1965, 1975, and 1985 studies utilized essentially the same protocols, we did not project any significant bias in the upper grades.

1 3 *Objectives*. The objectives of this research were

1. Assess the physical fitness status of American public school children and youth ages 6-17, and establish national norms for this age group by sex and age, in five percent increments

2. Compare these data with the results of three similar studies completed in 195 1965 and 1975

3. Review and modify, if necessary, standards for the President's Council on Physical Fitness and Sports *Presidential Physical Fitness Award* for school children

The intent of Objective One is to provide percentile norms in five percent increments for each sex and age for each test. A trend analysis by sex and age comparing the 1958-65-75 results with the new 1985 data will also be presented.

CHAPTER 2

Background

2 1 *Introduction.* The primary purpose of this section is to present a brief history of the American Alliance for Health, Physical Education, Recreation, and Dance (AAHPERD) Youth Fitness Test, and to review findings germane to the changing levels of physical fitness in school children since 1958 The Alliance has had several name changes in the past decade, from Association to Alliance, and the addition of Dance to the title All references will refer to the AAHPERD, regardless of time period

The problem of physical fitness in youth is by no means new to this generation and statements deploring the lack of fitness can be traced to the colonial period in American history In times of war, interest runs high and during years of peace interest declines A brief overview of factors influencing public interest in physical fitness during the past 25 years will be reported

Within the short period of five years following the close of World War II, the United States was once again faced with the challenge of sending men to the field of battle in Korea The increase in the number of men selected for the draft and the resulting rejection rate gave cause for concern While it may be argued that many rejectees were not taken for reasons other than a lack of fitness, few would deny the desirability of having recruits physically fit. The Korean War contained another unsavory incident, namely, the questionable behavior of some of the prisoners of war In 1955, as a direct result of this it became necessary for President Eisenhower to write Executive Order 10631 specifically spelling out the expected conduct for prisoners of war Our experience in the Korean War undoubtedly aided in establishing a receptive climate for subsequent events in the field of physical fitness

2 2 *AAHPERD Youth Fitness Test Development and History.* Later, in 1953, Kraus and Hirschland (26, 27) published several papers which probably did more to revitalize interest in fitness than any single report Their research indicated a failure rate on a minimum muscular fitness test of approximately 58 percent by American children in contrast to a failure rate of approximately nine percent by Austrian, Italian and Swiss children Although some investigators questioned the validity of the test and the sampling techniques, the study received nationwide publicity and the public owes Kraus and his colleagues a debt of gratitude for sensitizing them to the lack of fitness in our youth

One course of action which resulted from the Kraus findings was President Eisenhower's creation of a President's Council on Youth Fitness by Executive Order in 1956 (the name was subsequently changed to the President's Council on Physical Fitness, and to The President's Council on Physical Fitness and Sports).

In this same month the AAHPERD hosted a national meeting held in Washington, D C , which was devoted to the problem of physical fitness The deliberations lasted several days, one recommendation was to conduct a national survey of youth fitness

In February, 1957,a meeting of selected members of the Research Council of the AAHPERD was held in Chicago. The purpose of the meeting was to recommend a physical fitness test battery for school children The participants were fully conscious of their charge and the possible pitfalls The pressing need for a nationwide survey of youth fitness served as a constant reminder to those in attendance that agreement on a test battery was of paramount importance It was also deemed important to devise a test which reflected physical activities of American school children, the Kraus-Weber Test was criticized because of its overemphasis on flexibility

The Research Council members used the following guidelines in the development of the AAHPERD Youth Fitness Test:

1. Tests which were reasonably familiar

2. Required little or no equipment
3. Could be administered to boys and girls
4. Could be given to the entire age range of grades 5-12
5. Measured different components of fitness
6. Would allow self-testing by the student

With the above considerations in mind, the Council members agreed on a test battery consisting of pull-ups (for boys), flexed arm hang (for girls), sit-ups, standing broad jump (long jump), shuttle run, 50-yard dash, softball throw for distance and the 600-yard run.

Since 1958, several changes have been made in the test battery. In 1964 modified pull-ups for girls were replaced by the flexed-arm hang; the softball throw for distance was eliminated. In 1974 modified sit-ups (one minute, flexed knees) were substituted for straight leg sit-ups.

The test battery was widely adopted by school systems and it has been estimated that well over 65 million pupils have been tested between 1958 and 1975 using this test (35). The support of the AAHPERD, plus the fact that the President's Council on Physical Fitness and Sports adopted and endorsed the test for its Presidential Award, accounted for the popular acceptance of the test battery. The novel opportunity of a school administrator being able to compare his pupils in physical fitness with national norms undoubtedly added another lure to the test. Prior to 1958 this would have been impossible.

2.3 *Summary of Previous National Surveys.* Data on the physical fitness of school children derived from national probability samples were reported in 1958, 1965, and 1975 by the AAHPERD and the PCPFS using the AAHPERD Youth Fitness Test (19, 20, 21), and in 1984 by the Office of Disease Prevention and Health Promotion (ODPHP) using a modified AAHPERD Health-Related Test (38).

In 1958, a national survey using the AAHPERD Youth Fitness Test was conducted to determine the status of youth fitness. The results of this series of simple tests shocked the nation (19). What everyone had always assumed that a normal American youth could do physically turned out to be a woeful overestimation of his actual abilities. School systems throughout the nation quickly used the norms established by these tests to determine how its student body performed in relation to the rest of the nation. The effects of this inquiry were far reaching. Physical fitness received a new emphasis, much of it encouraged by the late president John F. Kennedy.

The 1965 (20) study reported a significant upswing in some physical fitness scores. The physical fitness of the nation's youth, as measured by these tests, had vastly improved. New, higher norms were established. The survey was conducted once again in 1975 (21). This time, however, there was no significant improvement. Investigators were concerned that such a lack of progress could have been caused by what they saw as budget squeezes on physical education programs, the tendency to make such programs optional, and the need to expand other areas of the curriculum, i.e., courses leading to college preparation or technical skills.

In 1980, the AAHPERD developed the the AAHPERD Health Related Physical Fitness Test (1). The test contained four items, (1) distance runs (a nine minute, 12 minute, or a one mile run); (2) a sit and reach test for flexibility; (3) modified sit-ups, and (4) skinfold measurements. Norms published for these events were obtained from volunteer schools throughout the country. Since these data did not reflect a national sample, no generalizations were reported.

The United States Office of Disease Prevention and Health Promotion, under a contract with Macro Systems, Inc. (38), in 1983-84 conducted the National Children and Youth Fitness Study (NCYFS). These data were obtained from a scientifically selected probability sample of school children, ages 10-17. Data on frequencies of participation in sports, and other exercise and active games were also obtained. This test battery had five items: (1) One mile walk/run (cardiovascular endurance), (2) sit-and-reach test

(flexibility), (3) one minute timed sit-ups (abdominal strength), (4) body composition measures from the triceps and sub-scapular skinfolds and (5) chin-ups (upper body strength/endurance) This study published percentile norms in the above tests and also concluded that children were significantly fatter than in the 1960's and reported that children who were active in the summer, and who engaged in a wide variety of activities, scored better than those who did not.

Several other studies of youth fitness have been reported Fleischman (11, 12) reported correlations and factor analyses on a variety of physical performance tests obtained from youth from volunteer schools in metropolitan areas These results were limited to large urban areas surrounding central cities Updyke (43) has recently reported data collected from over four million school children, ages 6 to 17, from over 10,000 public and private schools who took part in a program sponsored by Nabisco Brands and the AAU. These data also were generated from volunteer schools The tests included a series of exercises that included distance runs, sprints, long jumps, high jumps, sit-ups, push-ups and pull-ups. Although the basic standards were designed to be attainable by the average healthy youngster in each age and sex group, he reported only 43 percent of the respondents were able to achieve them during the 1979-80 and 1980-81 school years. His findings agreed with the results reported in the three AAHPERD Youth Fitness Tests—that there was large room for improvement in all these performance tests, and that children are not as fit as they could or should be

CHAPTER 3

Research Design

This chapter will present a detailed description of the physical fitness test battery selected for this research, the proposed sample design, and the method of orienting school personnel to the objectives and administration of the tests Procedures used to collect and statistically analyze the data will also be discussed.

3 1 *Review of Test Battery*. An *Ad Hoc* review panel was convened in Washington, D.C in November, 1984. The charge of this committee was to make recommendations for the 1985 PCPFS National School Population Fitness Survey (NSPFS). This group of experts included cardiologists, orthopedists, school principals, state and local administrators of physical education, physical education teachers, university professors specializing in motor learning, educational psychology, and exercise physiology, representatives from AAHPERD and the National Recreation and Park Association, and several staff members of the President's Council on Physical Fitness and Sports Members of the panel are listed below

1 Blumenthal, Kent, Ph.D
Policy Associate, Public Affairs
National Recreation and Park Association

2. Ciszek, Raymond, Ph D.
Director, Association for Research Administration,
Professional Council and Societies
American Alliance for Health, Physical Education,
Recreation, and Dance

3 Fox, Samuel, M III, M.D
Director, Cardiology Exercise Laboratory
Georgetown University Medical Center

4. Freeman, Vinna
Director, Health, Physical Education, Athletics and Safety
Washington, D C , Department of Education

5. Hayes, Ash E , Ed D
Executive Director
President's Council on Physical Fitness and Sports

6. Hunter, Dale, Ph.D.
Chief of Curriculum
Department of Defense Dependent Schools

7. Kroll, Walter, Ph.D.
Commonwealth Professor,
Department of Exercise Science
University of Massachusetts

8. Moser, Del
Supervisor, Health and Physical Education
State Department of Education, Virginia

9 Moyer, James
Teacher
Oakview Elementary School
Virginia

10 Mozzini, Lou
Coordinator, Health and Physical Education
San Diego County Department of Education

11 Nirschl, Robert, P , M D
Clinical Assistant Professor,
Division of Orthopedic Surgery
Georgetown School of Medicine

12 Porter, Don
Principal
Smith Elementary School, Stockbridge, Michigan

13 Pruitt, Castle
Teacher
McFarlane Junior High School,
Washington, Pennsylvania

14 Shaffer, Thomas, M D
Pediatrician
Columbus, Ohio

15 Spain, Christine G
Project Officer, NSPFS
President's Council on Physical Fitness and Sports

16 Swengros Glenn V
Director, State and Federal Relations
President's Council on Physical Fitness and Sports

17 Taylor, Robert M , Ph D.
Director, Health and Physical Education
State Department of Education, Missouri

This was the first time that a scientifically selected probability sample was used to obtain fitness data from children below grade five The advisory panel understood that the tests should be appropriate for all age groups, six through seventeen and that if changes were recommended in some of the tests, direct comparison with the 1958-65-75 studies would not be possible. Several modifications and changes were made in the 1965 and 1975 surveys, and it was important to not only review these changes but consider other alternatives as well. Recommendations were also necessary relative to the appropriateness of the 600 yard run/walk mile, or mile and one-half run/walk for the younger age groups Other important considerations included whether test changes, modifications or replacements would necessitate adjustments to the sample design, as well as the effects of these changes on response rates.

The consensus of the panel recommendations were (1) eliminate the 600 yard run/walk and replace it with a mile run/walk, (2) change the sit-ups to arms crossed over chest and emphasize that the scapula must touch the mat in the down position, (3) add a two mile walk and a trunk flexibility test, it was suggested that the flexibility test should use no equipment, (4) test both boys and girls on pull-ups and

flexed-arm hang, and, (5) retain the shuttle run, standing long jump, and 50 yard dash These recommendations resulted in the selection of the following nine test items for the study, pull-ups and flexed-arm hang, mile run/walk, curl-ups, shuttle run, standing long jump. 50 yard dash. V-sit reach and two mile walk. All items were to be administered to both boys and girls ages 6-17

3.2 *Description of Test Battery*. Each test item will be reviewed in this section, identifying its purpose, administration and scoring, equipment and facilities needed, and reliability ranges Few validity studies are available on the separate test items but the scientific literature supports the common practice of accepting their factorial validity. This type of validity identifies the more important test content underlying action fitness constructs (factors). The coefficients range from 0 51 to -0.71 (the negative coefficients are in the runs) (39) Negative coefficients result in a higher running time reflecting a poorer test score.

A description of each test follows Both boys and girls participated in each test

1 *Pull-ups*

Purpose Measure upper arm and shoulder girdle muscle strength and endurance

Equipment. A metal or wooden bar approximately 1-1/2 inches in diameter is preferred A doorway gym bar can be used, and, if no regular equipment is available, a piece of pipe or even the rungs of a ladder can serve the purpose

Description. The bar should be high enough so that the pupil can hang with his arms and legs fully extended and his feet free of the floor Use the overhand grasp (palms away from face) After assuming the hanging position, the pupil raises his body by his arms until his chin can be placed over the bar and then lowers his body to a full hang as in the starting position. The exercise is repeated as many times as possible

Rules. 1 Allow one trial unless it is obvious that the pupil had not had a fair chance

2 The body must not swing during the execution of the movement The pull must in no way be a snap movement If the pupil starts swinging, check this by holding your extended arm across the front of the thighs

3 The knee must not be raised and kicking of the legs is not permitted

4 Partial pull-ups do not count The chin must be pulled over the bar to be a complete pull-up

Scoring. Record the number of completed pull-ups to the nearest whole number

Reliability 0 82 - 0 89

2 *Flexed-arm hang*

Purpose. Measure upper arm and shoulder girdle muscle strength and endurance

Equipment. A horizontal bar approximately 1-1/2 inches in diameter is preferred A doorway gym bar can be used and if no regular equipment is available, a piece of pipe can also serve the purpose A stopwatch is needed.

Description. Adjust the height of the bar so it is approximately equal to the subject's standing

height. Use of an overhand grasp (palms away from face) With the assistance of two spotters, one in front and one in back of subject, the subject raises her body off the floor to a position where the chin is above the bar, the elbows are flexed and the chest is close to the bar The subject holds this position as long as possible

Rules. 1. The stopwatch is started as soon as the subject takes the starting position

2 The watch is stopped when. (a) subject's chin touches the bar, (b) subject's head tilts backward to keep chin above the bar, (c) subject's chin falls below the level of the bar

Scoring. Record in seconds to the nearest second the length of time the subject holds the starting position

Reliability 0 74.

3 *Curl-ups* (One Minute-Flexed Leg)

Purpose. Measure abdominal muscle strength and endurance

Equipment. Mat or floor

Description. The pupil lies on the back with knees bent, feet flat on the floor, heels no more than 12 inches from the buttocks, and back flat on floor The angle at the knees should be no less than 90 degrees. Arms are crossed over chest, fingers on opposite shoulders, elbows against chest. A partner holds the feet down to keep them in touch with the surface The student brings upper body forward, curling up to touch elbows to thighs This action constitutes one curl-up The subject must then return to the starting position before executing another curl-up The exercise is repeated for one minute, and the subject completes as many as possible in the one minute interval

Rules 1 The fingers must remain in contact with the shoulders throughout the exercise

2 The back should be rounded and the head forward when sitting up as in a "curl" up

3 When returning to starting position, the scapula must touch the mat before curling up again

Scoring One point is given for each complete movement of touching elbows to thighs No score should be counted if the fingertips do not maintain contact with the shoulders or if the pupil pushes up off the floor from an elbow, or if elbows are extended from the chest to contact the thighs

Reliability 0 68 to 0 94

4 *Shuttle Run*

Purpose. Measure lower limb muscule strength, endurance and agility

Equipment. Two blocks of wood, 2 in x 2 in x 4 in , and stopwatch Pupils should wear sneakers or run barefooted

Description. Two parallel lines are marked on the floor 30 feet apart The width of a regulation volleyball court serves as a suitable area Place the blocks of wood behind one of the lines The pupil starts from behind the other line On the signal "Ready? Go" the pupil runs to the blocks, picks one up, runs back to the starting line and places the block behind the line, he then runs back

and picks up the second block which he carries back across the starting line If the scorer has two stopwatches or one with a split-second timer, it is preferable to have two people running at the same time To eliminate the necessity of returning the blocks after each race, start the races alternately, first from behind one line and then from behind the other

Rules Allow two trials with some rest between

Scoring Record the better of the two trials to the nearest tenth of a second

Reliability 0.68 - 0 75

5 *Standing Long Jump*

Purpose. Measure explosive power of lower limbs

Equipment. Mat, floor or outdoor jumping pit, and tape measure

Description. Pupil stands with the feet several inches apart and the toes just behind the take-off line. Preparatory to jumping, the pupil swings the arms backward and bends the knees The jump is accomplished by simultaneously extending the knees and swinging the arms forward

Rules. 1. Allow three trials

2 Measure from the take-off line to the heel or other part of the body that touches the floor nearest to the take-off line.

3 When the test is given indoors, it is convenient to tape the tape measure to the floor at right angles to the take-off line and have the pupils jump along the tape The scorer stands to the side and observes the mark to the nearest inch

Scoring. Record the best of the three trials in feet and inches to the nearest inch

Reliability 0 83 - 0 98

6. *50-Yard Dash*

Purpose. Measure running speed

Equipment. Two stopwatches or one with a split-second timer

Description. It is preferable to administer this test to two pupils at a time Have both take positions behind the starting line. The starter will use the commands "Are you ready? ' and "Go " The latter will be accompanied by a downward sweep of the starter's arm to give the timer a visual signal

Rules. The score is the amount of time between the starter's signal and the instant the pupil crosses the finish line.

Scoring. Record in seconds to the nearest tenth of a second

Reliability 0.83 - 0.94.

7. *One Mile Run/Walk*

Purpose. Measure cardiorespiratory endurance

Equipment. Track or area marked off for one mile

Description. Pupil uses a standing start At the signal "Ready? Go" the subject starts running The running may be interspersed with walking if the subject tires. It is possible to have at least a dozen subjects run at one time by having the pupils pair off before the start of the event Then each pupil listens for and remembers his partner's time as the latter crosses the finish line The timer merely calls out the times as the pupils cross the finish line.

Rules. Walking is permitted, but the object is to cover the distance in the shortest possible time

Scoring. Record in minutes and seconds

Reliability 0.65 - 0.92.

8. *V-sit reach*

Purpose Measure hamstring and low back flexibility.

Equipment. Two pieces of two-inch wide adhesive tape, 5 x 8 card

Description. A straight line two feet long is marked on the floor using one piece of tape. This is the "base line." At the midpoint of the baseline, mark a perpendicular line to the base line using the other piece of tape, which extends two feet on each side of the base line. This is the "measuring line." Place one inch and one-half inch marks along the measuring line tape on each side of the baseline. The baseline intersect is the zero point.

After removing shoes, subject sits on floor so that the measuring line is between the legs and the soles of the feet are just behind the baseline, legs 8 to 12 inches apart The feet should be vertical

The subject clasps thumbs so hands are together, palms down and placed on the floor between lower legs; feet are close to vertical While legs are held flat on floor at knees the subject slowly reaches forward along the measuring line, keeping fingers in contact with the floor Three extensions are given, on the fourth the subject holds a three second count and the distance is then recorded

Rules. The fourth reach measured with the backs of the legs against the floor at the farthest point the subject can reach represents the score Fingers must be in contact with the surface of the floor

Scoring. Scoring is based on the farthest point reached on the fourth trial, this point must be held for three seconds A 5 x 8 card is helpful to mark this point for measurement. All scores are recorded to the nearest half-inch A touch at the intersect point is scored "0;" a reach above the baseline intersect is scored as a "plus" score, while a reach below the intersect point is scored as a "minus" score.

Reliability. 0.70 - 0 94

9. *Two-Mile Walk*

Purpose. Measure cardiorespiratory endurance.

Equipment. A stop watch.

Description. The subjects are instructed to cover the distance as fast as possible while walking

Rules. One foot must be in contact with the ground at all times or the subject is running

Scoring. Record in minutes and seconds

Reliability. No data available in literature

3.3 *Calibration of Instruments.* The calibration of the test instruments did not pose a problem of large magnitude. Five of the events, the flexed-arm hang, mile run, two mile walk, 50-yard dash, and curl-ups, required a stopwatch or a watch with a sweep second hand. In both the curl-ups and in the runs, a few seconds of error will not appreciably change the percentile score Testers were asked to ascertain that their watches were in good working order and it was recommended that a stopwatch, commonly used to time track events, be used.

Similar questions might be raised about running on different surfaces, such as dirt tracks, all-weather surfaced tracks, gym floors and the like. Also, the effects of footwear and clothing should be considered Testers were impressed with the necessity of all subjects participating in tennis shoes and gym clothing (shorts and shirt). This has not posed a problem in past surveys.

Performing on different types of surfaces, however, could minimally affect some results It is impossible, however, and also a great burden on the school personnel, to impose standardized surfaces for the tests. One can make the argument that, since these are national norms, the different surfaces,weather conditions, temperatures and humidities are all "averaged out" in the final norms. Thus, when any single student, or class average, is compared with the norms one can assume that these surface differentials all are factors in the scores.

An alternative would be to bring all subjects to a constructed facility where temperature, time, humidity and running and jumping surfaces could be controlled and standardized The expense and time involvement of such data collection would certainly be rash

There were no data in the literature which reported the relationship of the V-sit reach test (sitting, reaching between the legs) used in this battery, with the V-sit reach test utilizing a "stretch box." A pilot survey was conducted in the Southeast Michigan geographic area to determine the correlations between these two tests by sex and age. Just on face value, one would expect the two to be highly correlated, as they both use almost identical musculature and testing techniques

A sample of 297 boys and girls from five schools representing grades K-12 yielded the following correlations: two greater or equal than 0.95, two greater than 0.90 but less than 0.95, three greater than 0.85 but less than 0.90, eight greater than 0.80, but less than 0.85, and four greater than 0.75, but less than 0.80. Children in grades K-6 were reported with boys and girls scores together, children from grades 7-12 yielded data from boys and girls separately These associations were considered sufficiently high to proceed with the V-sit reach test without equipment, using the former test as the criterion The reliabilities ranged from 0 70 - 0.94 in this pilot survey.

3.4 *General Remarks.* These tests permitted a fairly sound basis for measuring the physical fitness of children, ages 6 to 17. They also allowed direct comparison with the three other national tests in 1958, 1965, and 1975 It should be observed, however, that these are, for the most part, simple tests that can be administered without incurring a large dollar cost or expending a great deal of school time. The time factor is very important in obtaining favorable response rates These tests can discriminate quite well at either end of a fitness continuum, but might not differentiate as well among fitness levels in the middle ranges. One of the major objectives of this test as it was originally devised was as a screening test which would identify pupils at the lower percentile levels for additional attention

3.5 *Summary of Variables* Below is a summary list of the fitness component variables in each test item in the study.

Pupil Physical Fitness

1. Pull-ups, upper arm and shoulder girdle muscle strength and endurance
2. Flexed-arm hang, upper arm and shoulder girdle muscle strength and endurance
3. Curl-ups, abdominal muscle strength and endurance
4. Shuttle Run, lower limb muscle strength, endurance and agility
5. 50-Yard Dash, running speed.
6. One Mile Run/Walk, cardiorespiratory endurance
7. Standing Long Jump, explosive power of lower limbs
8. V-sit reach, hamstring and low back flexibility
9. Two-Mile Walk, cardiorespiratory endurance

Pupil Demographic Characteristics

10. Age (birthdate)
11. Sex
12. Height
13. Weight
14. Grade in School

3.6 *Access and Field Work.* The crucial step in the design plan was the access to the schools and the field work involved in collecting the data. The general plan of the access and field work followed the design of the 1958, 1965 and 1975 studies. The refinement of the access and field work in each of these studies enabled the principal investigator to obtain previously unheard of national response rates in 1965 and in 1975 (100 percent of schools). Experience in these surveys and in dealing with local school personnel has dictated to us that this format is the most cost effective measure of achieving the survey objectives. Permission to enter school districts and to do the testing and field work was accomplished in eight distinct steps.

1 The permission and cooperation of the appropriate State Director of Physical Education was secured to proceed with the research The State Director was requested to write a short letter of endorsement of the study to each of the superintendents in the sample school districts

2. Appropriate City Directors of Physical Education were notified of their selection and briefed on the objectives and design of the study.

3. A letter was mailed to the Superintendent of Schools in the selected districts, explaining the purposes, objectives, personnel and time implications of the study Appropriate documents explaining the research were also provided. The specific emphasis of these documents was that the financial investment of the school district or school was not required, individual districts or schools were not to be identified with the results, testing time would be confined to no more than three class periods, and that

the sample was not designed to compare individual schools within or between districts, or between states. It was emphasized that the generalizations were to be for the overall population only We have found that not being identified with the results was the singly most important consideration in obtaining cooperation.

4 Principals of the selected schools were mailed all of the informative documents sent the superintendents and a work sheet was sent requesting a list of physical education classes with enrollments for each (for schools in which physical education was a required subject in the grades sampled) along with a list of the number of students in each class

5. An appropriate number of classes (targeted at one class per grade level per school) was selected from the lists supplied.

6. An orientation meeting was conducted in each state in a centrally located city as well as in individual school districts where necessary. Two personnel from each district were invited to attend; where possible we suggested the Superintendent or a principal and the Director of Physical Education We also invited the State Director of Physical Education where appropriate. The meetings were completed in a one day session, averaging three and one-half hours for each. Travel, lodging and meal expenses were paid for all attending. The sessions included explanation of the objectives of the research, a discussion, demonstration and standardization of all testing procedures, the range of dates within which the testing was to be completed, directions for recording data on data collection cards, and methods for handling pupil non-response The importance of recording the student response rate was also emphasized

7. Classes were previously sampled from the lists provided by the principals. Each class was identified by a sticker on a mailing bag ("jiffy bag"), and the appropriate number of data cards were enclosed in the bag. The jiffy bag was addressed with the Ann Arbor research office address, the bag had the appropriate postage. Test personnel needed only to enclose the data, staple the bag closed on completion of the testing, and place it in a convenient mail drop.

3.7 *Further Design Controls*

1 We found that orientation meetings were the single most important aspect of the design in ensuring reliable data collection. This protocol followed the 1958, 1965, and 1975 research designs These meetings gave testers and researchers the opportunity to "eyeball" each other and to ask questions and make comments on a face-to-face basis. They established excellent rapport between researchers and testers and gave each of the testers a sense of self-importance as well as a feeling for the overall contribution of the study. We have rejected other alternatives for data collection, largely because of our previous high response rates (over 95 percent school and class, and over 90 percent student) We have found an overwhelming majority of school physical education personnel to be extremely familiar with the AAHPERD test items and their administration. This has been a key factor in the consistency and reliability of the data in each of the previous studies (1958,1965,1975) as well as in 1985.

Eleven school districts were visited during their testing periods. These districts represented a random selection from quadrants of the United States. It was found that data collection was very reliable and that the enthusiasm of the students who were participating in the testing was excellent.

2 Testers were instructed to make all possible efforts to test all students. If a student was absent or ill on the test day, the tester was instructed to test the student when back in school and able to perform When students could not perform one or more tests because of a minor injury, school personnel were asked to note that on the data card. Students were asked to perform all tests of which they were physically capable.

3. Students who had a slight injury (such as a hand sprain, etc.) which might have restricted their activity in one event, but not in others, were tested in those in which they could capably perform This

was a joint decision reached by the teacher and the student together

3.8 *Sensitivity*. The data recorded involved r othing of a sensitive nature These test items were used in three former national surveys and over 65,000,000 school children have taken these tests since 1958

3.9 *Confidentiality*

There was no attempt to reveal the identity of schools or school districts, except that the universe from which the sample was drawn is cited. Not only is this a guarantee of confidentiality, but identification would serve no useful purpose since the sample was valid only as a representation of U.S. schools in general and not representative of each school, school district, or state individually

The names of youths and school personnel were purged from score cards after receipt and the score cards were destroyed after use. No system of record, such as a list of participants, was kept No personally identifiable information was retained on any youth who took the test

3.10 *Sample Design.*

3.11 *Introduction.* The purpose of the following sections is to provide a technical description of the sample design for the 1985 National School Population Fitness Survey (NSPFS). The 1985 NSPFS was a national testing program designed to measure U.S. elementary and secondary students on a selected set of physical fitness tests. At each grade level, an equal probability sample of student was tested in the following nine tests:

1. Mile run;
2. Long jump;
3. Flexed-arm hang;
4. Pull-ups;
5. 50 yard dash;
6. Shuttle run;
7. Two-mile walk;
8. V-sit reach;
9. Curl-ups

A total sample of 18,857 students from grades 1-12 participated in the 1985 testing Each student in the study population received a 1/2135 chance of being selected to participate in the 1985 testing program

3.12 *Overview.* The study population for the 1985 NSPFS included all public school elementary and secondary students in the United States excluding kindergarten Excluded from the population were students enrolled in private or parochial schools, special schools for delinquents, exceptional, or gifted children and schools for American children living abroad.

The 1985 NSPFS was based on a four stage equal probability sample of the public school student population: a first stage sample of primary area locations (Standard Metropolitan Statistical Areas [SMSA's] and counties); a second stage sample ofU.S. public school districts headquartered in the sample primary areas; a third stage sample of schools within selected districts, and a fourth stage sample of classrooms from selected schools. Within selected classrooms, all students were asked to participate in the assigned test sequence.

3.13 *Primary Area Locations.* The primary stage sample for the 1985 NSPFS consisted of 50 primary areas, the 16 largest SMSA's and the C half-sample of the remaining primary areas in the Survey Research Center's (SRC) 1980 National Sample. The C half-sample consists of half of the primary, or 34 nonself-representing areas of the national sample. The 1980 SRC National Sample is a stratified area

probability sample of all SMSA's and counties in the U.S A. The C-half sample is one of four replicates of the master design for the 1980 National Sample. For this study we included all of the 16 self-representing areas (the 16 largest SMSA's), each selected with a probability of 1 0 at the primary stage of sampling. The remaining 34 selected primary areas (the C sample of the non-self-representing areas) were selected with probabilities proportionate to their 1980 total occupied housing unit counts (a measure of size highly correlated with the primary areas' total student populations). A detailed description of the SRC National Sample design is available in Heeringa, et al , (1985), *1980 SRC National Sample: Design and Development.*

Primary Sampling Unit (PSU) codes in Table 3.1 indicate the size classification for each PSU A code with 9 in the hundreds position indicates the self-representing class (e g , the 900's and 1,900's) An 8 in the hundreds position indicates the nonself-representing SMSA class The remaining codes identify the nonSMSA class of counties

3.14 *Second Stage Sample of School Districts.* The second stage of sampling involved the selection of a sample of 57 school districts from the collection of districts which serve the 50 sample primary areas Since school districts are not generally contiguous with the boundaries of individual counties or SMSA's, an objective rule was applied to uniquely link each U.S. school district to one and only one county or SMSA. Under the linking rule, each district in the United States was linked to the county in which its headquarters was located. In nearly all cases this objective rule links the district to the county from which all or most of its students are drawn.

The sampling frame for the second stage of selection was a master list of the approximately 14,600 school districts which make up the U.S. elementary and secondary public education system Computerized access to this master list was obtained under a lease agreement with Market Data Retrieval (MDR), a Chicago based firm specializing in the development and maintenance of national lists schools and other organizations. Each record on the master list provided: the name of the district, the name and the address of its current superintendent; its location (place and county); a three category urban/rural code; a grade range code; and a categorical code which indicated the enrollment size range of the school district

The actual sampling of school districts began with an application of the controlled selection technique to determine the allocation of the n = 57 sample districts to the 50 primary areas and within each primary area to determine the allocation of the one or more sample districts to defined urban/suburban/rural substrata. For the latter, the urban/rural/substrata were defined using the indicator code included on the data record for the district. The controlled selection of districts was performed with probabilities proportionate to the district's size

Before selecting sample districts the list was checked for two characteristics requiring special handling. Several states have many Elementary School Districts and High School Districts Groupings were made in order to achieve a complete grade span within the selection Occasionally two small districts were attached to each other in order to reach a sufficient size For the selection purpose, these groupings or attachments were treated as single sampling units Attachments are indicated on the list

Table 3 1 presents a complete listing of the sample of districts along with the identifier code and name of the primary area to which it was assigned

3.15 *Third Stage Sample of Schools.* After the second stage sample of school districts was selected, the NSPFS study staff contacted state education offices, and when necessary, the individual school district headquarters, to obtain a current list of elementary and secondary schools As these lists were received, the SRC Sampling Section coded the school data and entered it into a computer file. Ideally and in the majority of cases, the list of schools provided the school name grade range and enrollment size. In a few districts no school-level data on enrollment were provided and it was necessary to estimate enrollments via an apportionment procedure which allocated the total district enrollment to schools As a matter of

TABLE 3.1

THE SECOND STAGE SAMPLE OF SCHOOL DISTRICTS

PSU Codes	Primary Area	District Name
NORTHEAST		
003	Cumberland, ME	School Administration District 15
822	New Britain, CT	Meridan City School District
833	Newburgh, NY	Washingtonville Central School Dist.
842	Neward, NJ	Rockaway Twp School District
		Morris Hills Reg. High Sch. Dist.
846	Allentown, PA-NJ	Northampton School District
901	Boston, MA	[No selection]
902	Nassau-Suffolk, NY	Massapequa School District
903	New York, NY-NJ	Ridgefield School District
	(2 selections)	Schools in Queens (not ident as SD)
904	Philadelphia, PA-NJ	Philadelphia City School District
905	Pittsburgh, PA	Pittsburgh City School District
NORTH CENTRAL		
1047	Wayne, OH	Triway Local School District
1142	Jersey, IL	Community School District 100
1491	Howell, MO	Willow Springs School District R4
1637	Adams, NE	Hastings School District 18
		Kenesaw School District
1804	Cleveland, OH	Cleveland City School District
1814	Toledo, OH	Maumee City School District
1827	Terre Haute, IN	Vigo County School District
1846	Appleton, WI	Winneconne School District
1873	Fargo, ND	Moorhead Ind. Sch. Dist. 152
		Hawley Ind. Sch. Dist
1901	Chicago, IL	Evanston CC Sch. Dist. 65
	(2 selections)	Community High School Dist. 218
		Forest Ridge Sch. Dist. 142
		Reavis Twp High Sch. Dist. 220
1902	Detroit, MI	Fraser Public School District
1903	Minneapolis, MN	Minneapolis School District 1
1904	St. Louis, MO	[No selections]
DEEP SOUTH		
2324	W. Feliciana, LA	W. Feliciana Parish Sch. Dist.
2806	Rockhill, NC	York School District 1
2818	Huntsville, AL	Madison County School District
2901	Atlanta, GA	Clayton County School District

TABLE 3.1 (cont'd)

REMAINDER OF SOUTH		
3033	St. Lucie, FL	St. Lucie County School District
3043	Avery, NC	Avery County School District
3229	Randolph WV	Randolph County School District
3304	Marshall, KY	Marshall County School District
3803	Broward, FL	Broward County School District
3812	Orlando, FL	Orange County School District
3837	Wilmington, DE	Edgecombe County School District
3848	Chattanooga, TN	Chattanooga City School District
3861	Tulsa, OK	Burbank School District 20
		Pawhuska School District 2
3881	San Antonio, TX	Sequin Ind. School District
3901	Baltimore, MD	Baltimore County School District
3902	Washington, D.C.	[No selection]
3903	Dallas-Ft.Worth, TX	Plano Ind. School District
3904	Houston, TX	Houston Inc. School District
WEST		
4042	Bannock, ID	Pocatello School District 25
4812	Phoenix, AZ	Paradise Valley Unified Dist. 69
4822	Seattle, WA	Edmonds School District 15
4830	Anaheim, CA	Anaheim Union High School Dist.
		Anaheim City School District
4838	Sacramento, CA	San Juan Unified School District
4841	San Jose, CA	Los Gatos Union Elem. Sch. Dist.
		Los Gatos Joint Union HS Dist.
4901	Los Angeles, CA	Los Angeles Unified School District
4902	San Francisco, CA	Jefferson Union High School Dist.
		Jefferson School District

practicality at this stage, the enrollment measures of size for all listed schools were converted to "class units," where each class measure represented approximately 25 enrolled students In the third stage of selection, a PPS sample of from 3 to 7 schools was then selected from the computerized list for each district. The PPS sampling procedure incorporated a stratification of schools both by grade range and enrollment size (the latter being most effective in districts with large numbers of schools). In total, 199 individual schools were sampled, an average of just under four per sample school district

3.16 *Fourth Stage Sample of Classrooms.* In order to select classrooms within sample schools, lists had to be procured from the principals of these schools The study staff was responsible for preparing and mailing the blank forms to school principals, and for the return to use of the completed forms. The information requested included for each class and grade, classroom identification, indication of size, and sex of students (all boys, all girls, or both).

In designing this fourth and final stage of selection, two specific sample design objectives needed to be met:

1 Individual selection probabilities for classrooms were set such that the overall probability of selection is equal for each student in the study population; and,

2. The selection of classrooms was controlled to ensure a nearly uniform distribution of the sample to each of 12 age groups of interest

The first objective — to obtain an epsem[2] sample of classrooms and students — was met through a straightforward application of conventional multi-stage sampling techniques Within schools, classes were selected with equal probability.

The equal probability rate for each school was set to ensure a total final sampling probability of 1/2135 for each student in the study population.

As the completed lists were received, Sampling Section abstracted the information, and posted the data by PSU. School, grade and number of classrooms. Selections were made within the schools and the PSU in order to represent all grades on the PSU level, and at the same time to select an expected 4 classrooms per school. A running summary tabulation was kept in order to assure a total balance of selections by grade.

3.17 *Assignment of Test Modules.* With the controlled assignment of sampled classrooms to grades, there remained one additional complicating factor which needed to be addressed before testing could begin. The 1985 NSPFS incorporated testing in nine physical fitness tests. Based on past experience, the study staff felt that schools could be asked to test their students in at most six events and for practicality's sake the six events should be the same for all classrooms selected from a sample school

To allow testing in all nine events and at the same time limit the demands on individual students, the nine tests were organized into three test modules of three events each:

MODULE A	Mile Run
	Long Jump
	Flexed-arm hang
MODULE B	Pull-ups
	50 Yd Dash
	Shuttle Run
MODULE C	Two-mile Walk
	V-sit reach
	Curl-ups

[1] *Probability Proportionate to Size*
[2] *Equal Probability of Selection Method*

Sample classrooms in each sample school were then assigned at random to two of three test modules Students in sample classrooms were then tested in each of the six events contained in the two assigned test modules.

The distribution of modules to schools was posted on the PSU/school/classroom form referred to above. The running summary tabulation included the test module One complication resulted from the restriction that all selections from one school should use the same module. However, within the PSU the goal was to achieve a reasonable balance. Over the entire sample the balance of module by grade was remarkably clo e.

The specific outcome of this particular methodology was that within a given grade level, two-thirds of the sample students participated in each test Descriptive statistics — means, percentiles — for each test can be computed using data for two-thirds of each grade level/age group sample Likewise, correlations among tests within the same module were computed on two-thirds of the grade/age level sample. However, correlations between scores for tests from two separate modules can be computed from only one-third of sample cases

3.18 *Summary and Response Rates.* To summarize, the sample design was a four stage epsem (equal probability of selection method) clustered sample This resulted in a self-weighting sample such that the product of the probabilities at each selection stage was equal to 1/2135:

Prob (PSU) x Prob (District) x Prob (School) x Prob (Class)
= 1/2135

Each student in the population had an equal chance, 1/2135 of being selected The population universe was estimated at 41,000,000 public school children in grades 1-12, thus approximating 20,500,000 students of each sex The sample yielded a total of 18,857 students, 9,678 boys and 9,179 girls, selected from 32 states, 52 school districts and 167 schools Table 3 2 presents the response rates by district and by school.

No response rates were kept for students It will be recalled that the design called for 19,200 students, the final count was 18,857 (98% of estimate) The expected number of students was 750 boys and 750 girls per grade; even with non-response considered the sample yielded statistically sufficient number of subjects per grade. The distribution of students per grade is presented in Table 3 3

An explanation of the slightly lower numbers in the elementary grades, and, the higher numbers in the upper grades is germane. Ages six and seven followed our response experience with elementary children. Class sizes in these early age groups tend to be erratic, — sometimes dramatically smaller than our overall estimate of 25 per grade. Also, these younger children miss more days due to sickness, bad weather and the like The n's obtained, however, represented sample sizes large enough to conduct all statistical analyses and from which to generalize to the national population

The upper age groups were found to simply contain more students per class than estimated In many cases one period could contain three "sections," with either one or two teachers In these cases it was difficult to identify a class "unit"; therefore, we took all sections in that period

TABLE 3.2

DISTRIBUTION OF RESPONSE RATES FOR SCHOOL DISTRICTS AND SCHOOLS

UNIT	NUMBER SAMPLED	NUMBER RESPONDING	PERCENT
School Districts	57	52	0.91
Schools	187	161	0.86

TABLE 3.3

DISTRIBUTION OF SAMPLE BY AGE AND SEX

AGE	BOYS	GIRLS	TOTALS
6-	374	391	765
7	636	604	1,240
8	706	669	1,375
9	652	612	1,264
10	655	658	1,313
11	765	754	1,519
12	815	786	1,601
13	935	995	1,903
14	1,139	1,183	2,322
15	1,077	1,085	2,162
16	874	711	1,585
17+	863	558	1,421
TOTALS	9,678	9,179	18,857

CHAPTER 4

Results

4 1 *Overview.* It will be recalled that nine separate tests were administered to boys and girls, ages six-17, in three different modules. Each student, therefore, took no more than six tests Of the nine tests, three were new, and not administered in either the 1958-65-75 surveys The new tests were a mile run/walk. V-sit reach and a two mile walk The curl-up test, while not new, was modified, and therefore not comparable to previous tests Flexed-arm hang, originally for girls only, was also administered to boys as well, and girls were also tested on pull-ups, originally a boys' only test The 600 yard run-walk was eliminated from the test battery

These modifications restricted the comparisons across years to the following four tests (1) shuttle run (2) standing long jump, (3) 50-yard dash, and, (4) pull-ups (boys only), flexed-arm hang (girls only) It is also important to note that only ages 10-17 could be compared with the former studies from 1958-65-75. since those surveys were limited to those age groups

The remaining test items, flexed-arm hang (for both boys and girls), one mile run/walk, two mile walk, and trunk flexibility (V-sit reach) will serve as baseline data for comparisons in future surveys

A review of the findings from the 1958-65-75 surveys revealed that significant improvements were reported in the 1965 study when compared with the original national survey in 1958 Although the 1965 data reported great improvement in the norms, there were no significant general gains indicated in the 1975 data; these results were almost identical with the 1965 results with the exception of some general improvement by girls in the 600 yard run/walk test The generalizations based on the 1985 comparisons will, therefore, focus primarily on the differences between the 1975 and the 1985 surveys in analyzing improvement, or lack of it, in 1985 A 't' test, using the five percent level of significance, was used in all significance testing

Since only four tests could be compared with previous years, there were 64 total comparisons (four tests x two sexes x eight ages) between the 1975 and 1985 surveys. These comparisons yielded a total of nine significant differences (14%), five in the boys' tests (0 08%) and four (0 06%) in the girls Most of these could be considered 'random' differences, that is, occurring just by chance with so many comparisons. The only apparent trend was in the girls' 50 yard dash, where four (33%) significant differences were found, which indicated that girls had lost some speed and leg strength since 1975.

The differences noted above, and other findings, will be detailed in the following paragraphs The results will be presented in three sections: (1) a comparison of 1985 with 1975 results (2) a comparison of the 1985 data with the 58-65-75 surveys, and, (3) a comparison of boys and girls scores in 1985 An overall summary, in addition, will precede specific findings for each test item

4 2 *Comparison of 1975-1985 Results.* The distribution of means with standard errors of differences for both boys and girls, 1975-1985 is reported in Tables 4 1 and 4 2 An example of the determination of significance in both Table 4 1 and 4 2 is germane here In Table 4 1, Boys Long Jump, age 13, the standard error of the difference, 1.09, is presented in the last column By dividing the standard error of the difference, 1 09, into the difference between the mean scores, 2 34, for 1985 and 1975, a value of 2 14 is obtained. Since this is equal to or greater than two standard errors this score is a statistically significant difference

A summary of the comparisons for these two years disclosed little or no differences in the test means,—indicating a lack of improvement For both sexes, eight ages, and four tests, a total of 64 comparisons yielded only nine (14%) statistically significant differences There were 26 actual mean performance differences which were judged better in 1985 and 21 which were poorer in 1985, 17 were the

TABLE 4.1

COMPARISON OF MEANS WITH STANDARD ERRORS OF DIFFERENCES FOR BOYS, 1985-1975

Test-Age	1985 x_1	1985 SE_1	1985 n_1	1975 x_2	1975 SE_2	1975 n_2	$x_1 - x_2$	$SEx_1 - x_2$
PU - 10	2.80	0.31	427	2.31	0.30	209	0.49	0.43
SLJ - 10	59.20	0.92	416	59.10	0.48	196	0.10	1.04
SR - 10	11.65	0.14	430	11.40	0.15	205	0.25	0.21
50 - 10	8.57	0.10	416	8.40	0.10	210	0.17	0.14
PU - 11	2.82	0.30	594	2.62	0.16	455	0.20	0.34
SLJ - 11	62.97	0.84	541	61.89	0.60	443	1.08	1.03
SR - 11	11.24	0.11	596	11.04	0.12	453	0.20	0.16
50 - 11	8.34	0.09	580	8.11	0.06	447	0.23	0.11*
PU - 12	3.19	0.29	577	2.80	0.25	504	0.39	0.38
SLJ - 12	65.51	0.86	531	64.87	0.58	507	0.64	1.04
SR - 12	10.72	0.09	579	10.84	0.94	489	-0.12	0.13
50 - 12	7.84	0.07	581	7.90	0.07	511	-0.06	0.10
PU - 13	3.82	0.31	605	3.57	0.27	530	0.25	0.41
SLJ - 13	70.96	0.87	585	68.62	0.66	521	2.34	1.09*
SR - 13	10.36	0.08	608	10.57	0.10	513	-0.21	0.13
50 - 13	7.53	0.07	608	7.61	0.07	534	-0.08	0.10
PU - 14	5.29	0.33	725	4.95	0.27	543	0.34	0.43
SLJ - 14	76.32	0.91	646	73.18	0.88	543	3.14	1.27*
SR - 14	10.10	0.10	723	10.20	0.10	542	-0.10	0.14
50 - 14	7.23	0.07	703	7.30	0.07	544	-0.07	0.10
PU - 15	6.42	0.35	643	6.48	0.51	533	-0.06	0.62
SLJ - 15	80.70	0.89	592	78.93	0.82	532	1.77	1.21
SR - 15	9.85	0.10	642	10.00	0.70	533	-0.15	0.14
50 - 15	6.95	0.06	622	6.93	0.05	531	0.02	0.08
PU - 16	7.18	0.38	535	7.09	0.26	422	0.09	0.46
SLJ - 16	83.79	0.97	530	83.03	1.01	428	0.76	1.40
SR - 16	9.55	0.11	527	9.97	0.01	415	-0.42	0.19*
50 - 16	6.77	0.07	498	6.77	0.05	531	0.00	0.09
PU - 17+	8.34	0.41	575	7.21	0.45	524	1.13	0.61
SLJ - 17+	87.13	0.99	482	84.88	1.14	534	2.25	1.51
SR - 17+	9.57	0.10	586	9.89	0.10	523	-0.32	0.14*
50 - 17+	6.71	0.06	548	6.74	0.07	525	-0.03	0.09

*Significant at 5% level.

TABLE 4.2

COMPARISON OF MEANS WITH STANDARD ERRORS OF DIFFERENCES FOR GIRLS, 1985-1975

Test-Age	1985 x_1	1985 SE_1	1985 n_1	1975 x_2	1975 SE_2	1975 n_2	$x_1 - x_2$	$SE_{x_1 - x_2}$
FAH - 10	12.48	1.66	404	12.69	1.32	243	-0.21	2.12
SLJ - 10	54.20	0.85	424	55.96	1.07	231	-1.76	1.37
SR - 10	12.21	0.14	445	11.94	0.20	238	0.27	0.24
50 - 10	8.93	0.10	439	8.66	0.09	239	0.27	0.13*
FAH - 11	10.88	1.27	556	13.04	1.19	451	-2.16	1.74
SLJ - 11	57.51	0.76	559	58.32	0.68	439	-0.814	1.01
SR - 11	11.70	0.12	605	11.61	0.17	441	0.09	0.21
50 - 11	8.61	0.09	594	8.39	0.05	450	0.22	0.10*
FAH - 12	10.96	1.20	505	11.93	0.11	521	-0.97	1.59
SLJ - 12	60.83	0.86	509	60.36	0.80	520	0.47	1.17
SR - 12	11.43	0.09	545	11.42	0.01	516	0.01	0.21
50 - 12	8.08	0.08	614	8.08	0.01	504	0.00	0.13
FAH - 13	11.04	0.94	627	11.18	1.19	513	0.14	1.52
SLJ - 13	62.50	0.79	620	63.01	0.71	508	-0.51	1.06
SR - 13	11.30	0 0	625	1.32	0.01	504	-0.02	0.20
50 - 13	8.08	0.08	614	8.08	0.01	504	0.00	0.13
FAH - 14	12.83	1.10	691	12.97	0.95	502	-0.14	1.45
SLJ - 14	63.73	0.82	667	64.23	0.72	512	-0.50	1.09
SR - 14	11.39	0.12	786	11.23	0.01	503	0.14	0.18
50 - 14	8.06	0.07	756	7.87	0.06	499	0.19	0.09*
FAH - 15	13.30	1.36	602	12.57	1.29	505	0.73	1.87
SLJ - 15	63.64	0.85	584	64.38	0.66	521	-0.74	1.08
SR - 15	11.10	0.09	695	11.24	0.01	505	-0.14	0.16
50 - 15	8.04	0.07	666	7.90	0.06	513	0.14	0.09
FAH - 16	12.37	1.51	410	10.19	0.79	408	2.18	1.70
SLJ - 16	63.82	1.01	415	63.13	0.08	413	0.69	1.28
SR - 16	11.10	0.11	441	11.47	0.02	405	-0.37	0.19
50 - 16	8.14	0.10	419	7.90	0.06	382	0.24	0.12*
FAH - 17+	12.09	1.64	313	11.61	1.08	408	0.48	1.96
SLJ - 17+	64.40	1.24	311	65.39	0.94	414	-0.99	1.56
SR - 17+	11.13	0.14	375	11.35	0.02	523	-0.22	0.21
50 - 17+	8.21	0.11	344	7.94	0.01	390	0.27	0.15

*Significant at 5% level.

same. The direction of these mean differences is revealing,—67 percent are in a negative direction While these differences are not statistically significant they do show a trend towards lower performances in 1985

Boys. There was little change in the performance of boys Of the 32 comparisons for boys, only five (15%) were statistically significant, four better than 1975 and one worse (Tables 4 1)

Boys 13 and 14 years old performed significantly better in the standing long jump Boys aged 16 and 17 scored significantly better in the shuttle run Boys age 11 performed significantly worse in the 50 yard dash. None of these findings are considered a trend which might indicate any overall improvement Figure 4.1 graphically illustrates these trends.

Girls. Girls ages 10,11,14, and 16 scored significantly worse in the 50 yard dash than their 1975 counterparts. Of 32 comparisons for girls, these four (13%) revealed statistically worse scores than in 1975 (Table 4.2). Median scores (Appendix D) indicated that girls at all ages scored poorer on all comparable tests than in 1975.

4.3 *Test Specific Findings 1975-1985.*

1. Girls' Flexed-Arm Hang. This test item disclosed more variability in performance than any other. Girls in 1985 disclosed very little improvement through the age groups. These data, although not significantly different from 1975, did show slight improvement up to 14 years, where scores tended to decline or plateau (Figure 4 1).

2 Standing Long Jump. The rate of improvement with age for girls was exactly the same for 1975 and 1985. Girls tend to stop improving at age 14 Boys in both years disclosed the same rates of improvement but, in contrast to the girls, continued to improve as they got older (Figure 4 1).

3. Shuttle Run. The improvement by age for girls is similar in 1975-85 until age 13 where the scores dropped slightly and then did not improve from ages 15-17 Boys continued improvement in times generally through all age groups (Figure 4.1)

4. Fifty-Yard Dash With the exception of age 13 the trend line for girls reported consistently poorer running times through the age groups. Times in both years did not improve from age 14 There were no differences in rate of improvement for boys ages 10-17 (Figure 4.1)

4.4 *Comparison of 1985 Data with 1958-1965-1975.* Figure 4 2 presents the test specific and general findings discussed below. It is interesting to note that, with the exception of the significant improvement from 1958, the 1958-1965-1975 studies disclosed no general improvement in test scores from 1965 to 1975. Previous statistical comparisons discussed above therefore, were between the 1975 and 1985 surveys. Note that the slopes of all trend lines in Figure 4.2 indicate that the rates of improvement, or lack of improvement, have been practically parallel through these years. This is very reassuring when looking at consistency of data collection in the four surveys The lone exception is the flexed-arm hang for girls, which shows a great deal more variation than any of the other variables These slopes show quite conclusively that physical education teachers in the field can collect data quite reliably

4 5 *Test Specific Findings, 1958-1965-1975-1985* The findings summarized below apply only to ages 10-17. Ages six to nine years were not tested until the present 1985 survey.

1. Flexed-arm hang The flexed-arm hang was not a test item in 1958, and until 1985 was only administered to girls In 1965, 1975 and in 1985 there were erratic swings in the mean scores At age 14, the 1975 and 1985 scores either plateaued or dropped. This did not happen in 1965 until age 16.

FIGURE 4.1

COMPARISON OF MEANS BY AGE AND SEX, 1975-1985

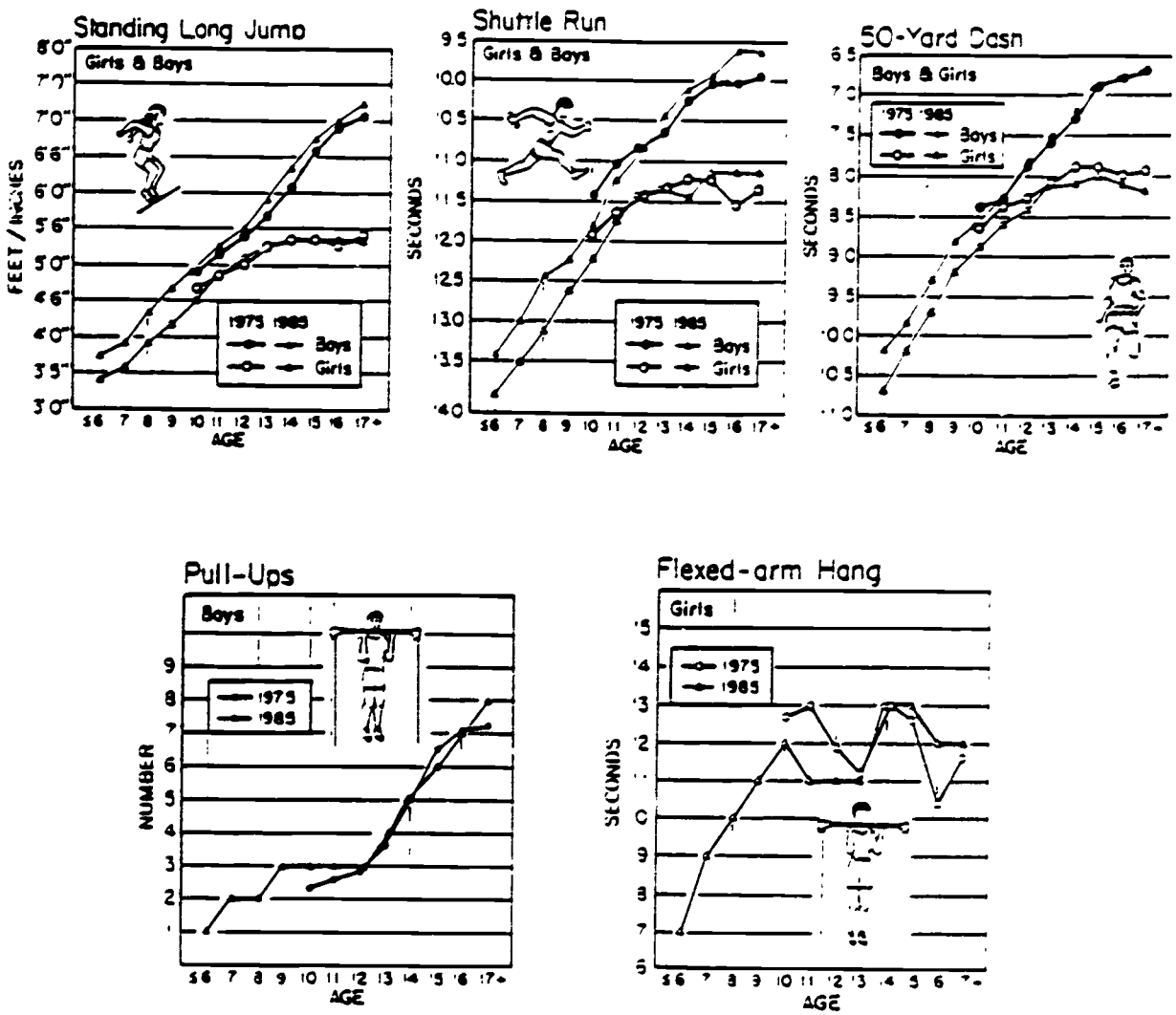
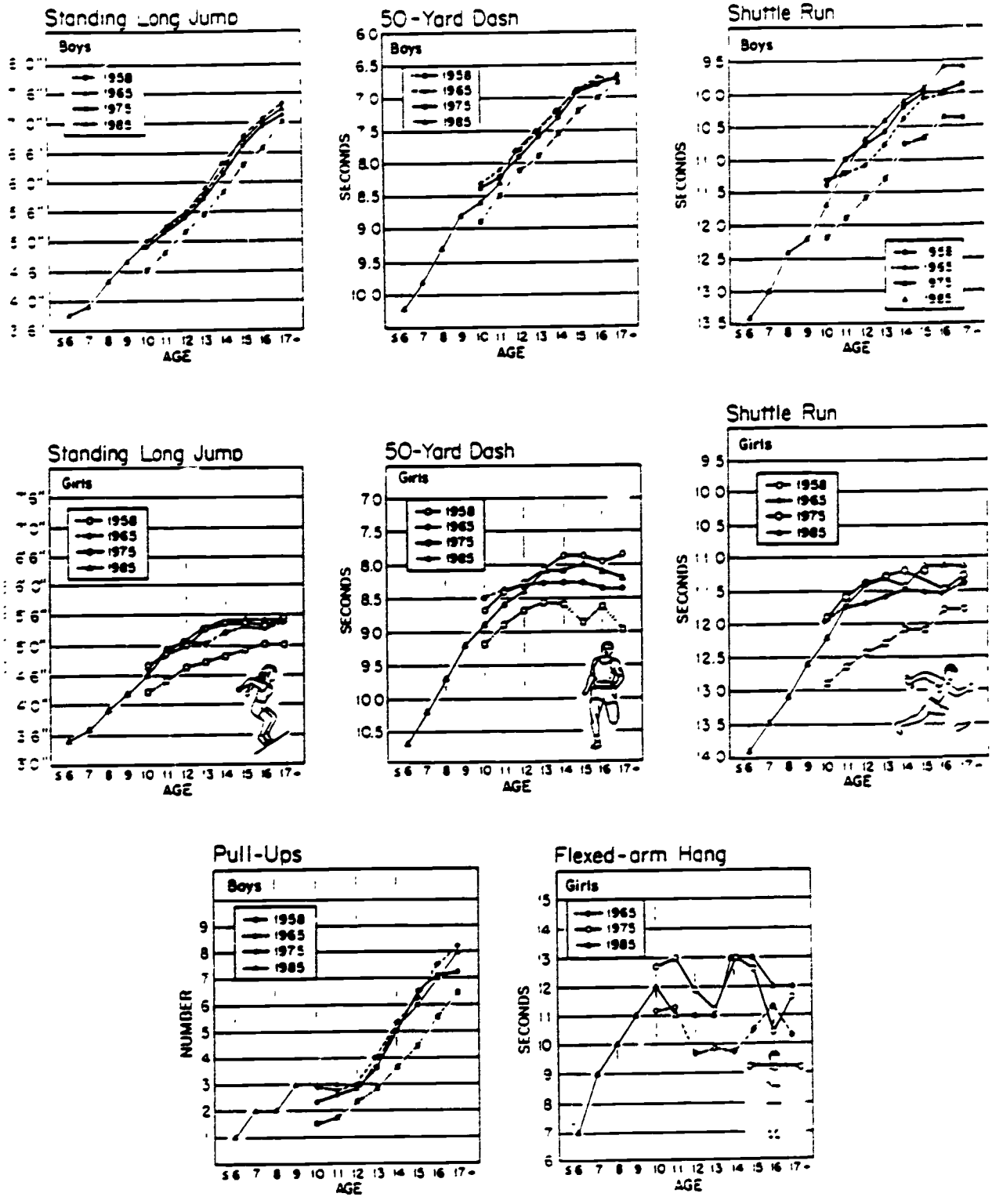


FIGURE 4.2

COMPARISON OF MEANS BY AGE AND SEX, 1958-1965-1975-1985



2. Pull-ups Pull-ups, prior to 1985, were administered to boys only When each of the years is compared the slopes disclose little or no changes in rates of improvement The 1958 data, though reporting significantly poorer scores than the 1965-1975-1985 scores, revealed the same rate of improvement

3 Girls' Standing Long Jump The mean trend lines for the four surveys were consistent through all age groups, showing some improvement from age 10 to 14, from age 14-17 little or no improvement.

4. Boys' Standing Long Jump All surveys, 1958-1965-1975-1985 disclosed almost identical slopes The rate of improvement from young to older was consistent in all years.

5 Girls' Shuttle Run The 1958 scores improved generally through the age groups This was true of 1965-1975-1985 to age 14, where the 1965-1975 scores declined while the 1985 data reported a slight increase and then plateau.

6. Boys' Shuttle Run All four surveys disclosed similar trends, an increase in performance levels to age 16 and no improvement from ages 16-17

7. Girls' 50-Yard Dash. In all four surveys there was no improvement in running time after age 14 The rates of improvement from ages 10 to 14 were similar

8. Boys' 50-Yard Dash. Through each of the four surveys, boys showed a general improvement in running times as they grew older. The mean times for 1965-1975-1985 were almost identical

4.6 *Performance of Boys and Girls in 1985 Survey.* The following summary and test specific findings refer to Figure 4.3.

1 Boys test performances were better than girls in all tests except in trunk flexibility (V-sit reach) and at age six in upper arm strength (pull-ups) and abdominal strength (curl-ups)

2 Girls did not improve with age in dynamic upper arm strength (pull-ups) An average six year old girl scored as well as a 17 year old. Boys steadily improved on this test, with a plateau from ages 9-12 and a steady increase from ages 12-17

3 Girls' rates of improvement generally paralleled the boys but with lower scores (the exceptions were V-sit reach flexibility), until about age 14, where they tended to plateau and then decrease.

4. Girls disclosed significantly better trunk flexibility (V-sit reach) than boys, and increased flexibility sharply from age 7-16 At age 16 girls' scores dropped.

5 Boys flexibility (V-sit reach) data were erratic through age 13 From age 14 to 17 boys showed sharp improvement, but scores were still much lower than girls.

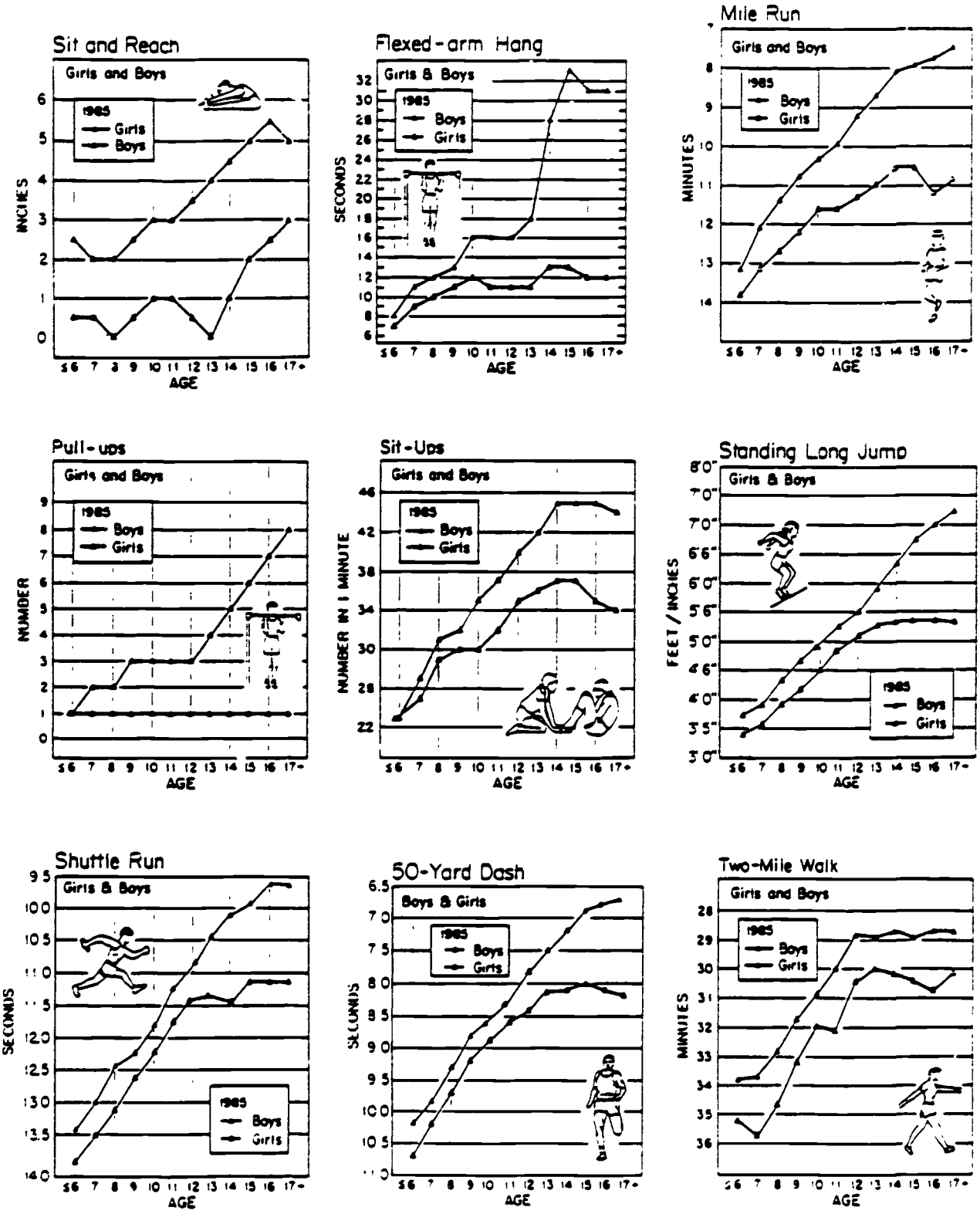
4.7 *Test Specific Findings of Boys and Girls Performance, 1985 Survey* Refer to Figure 4 3 and Appendix D for reference.

1 *Pull-ups.* Girls did not improve in upper arm strength from ages 6-17 Girls could only perform a mean of one pull-up through this age range Boys disclosed general overall improvement with the exception of a plateau from ages 10-12

Seventy percent of all girls tested could not do more than one pull-up, and fifty-five percent could not do any When these sample numbers are extrapolated to the U S. population, approximately 14,350,000 girls would be unable to do more than one pull-up Fifty five percent projects that 11,275,000 girls would

FIGURE 4.3

COMPARISON OF MEANS BY AGE AND SEX, 1985



not be able to do even one pull-up.

When the performance of the study sample is extrapolated to the national population, forty percent (8,200,000) of boys ages 6-12 would not be able to do more than one pull-up Twenty-five percent (5,125,000) would not do even one.

2. *Flexed-Arm Hang.* Girls improved at about the same rate as boys from ages 6-17, although reporting slightly lower scores. Boys improved steadily by age with the exception of a plateau from ages 10-12 At age 14 girls tended to plateau, then performance decreased slightly.

Extrapolations to the national population are as follows.

a. Fifty-five percent (11,275,000) of all girls would not be able to hold their chins over a raised bar for more than 10 seconds.

b Forty-five percent (6,525,000) of boys ages 6-14 would be unable to hold their chins over a raised bar for more than 10 seconds.

3. *Curl-ups* Girls improved at about the same rate as boys to age 14 where they plateaued and decreased performance slightly. From ages 14-17 girls scored much lower than boys

Boys increased performance until age 14; there they reached a plateau with no additional improvement

4. *Standing Long Jump.* Girls improved at the same rate as boys from ages six through 12, but with somewhat lower scores. No improvement was made after age 13, but scores did not decline Boys improved steadily from ages 6-17.

5. *Shuttle Run.* Girls progressed at about the same rate as boys to age 12, although their scores were lower. At age 13 girls' scores leveled out, then revealed a slight gain to age 15, where they plateaued once more Boys reported steady improvement through all ages.

6. *V-sit reach.* Girls' scores ranged from one and one-half inches to three inches better than boys With the exception of ages eight and sixteen, girls generally improved through the age groups. At both of these ages, scores declined one-half inch. National extrapolations of study results would show forty percent (6,400,000) of boys aged 6-15 would not be able to reach beyond their toes. Boys over 13 showed steady improvement by age, but still lagged behind the girls about two to two and one-half inches.

7. *Mile Run.* Approximately 50 percent (10,250,000) of girls aged 6-17 and 30 percent (6,150,000) of boys aged 6-12 would not be able to run a mile in less than 10 minutes based on national extrapolations of study data

Girls again paralleled boys' scores closely to age 10, although with lower scores. The times between the sexes began to widen at age 11. Once more at age 14, girls tended to plateau and then increase running time.

Boys disclosed steady improvement in times through the age groups

8. *Two Mile Walk.* Girls generally increased at the same rate as boys to age 14 From age 14-16, girls times became poorer, then showed slight improvement at age 17 Boys plateaued after age 12

4.8. *Distribution of Test Results by Selected Percentiles 1975-1985.* Tables 4.3 and 4.4 present the distribution of scores by selected percentiles comparing the percent of boys, and the percent of girls, in 1985 who scored better or worse than they scored in 1975 at the same percentile ranks. In other words, these tables report the percent of students in 1985 who scored higher, or lower, than the score for a similar percentile in 1975. The percentiles compared are greater than 50th, 75th, and 85th, less than 50th, and 25th. For example, in Table 4.3 10 year old boys' pull-ups, 32 percent were higher than the score at the 75th percentile for 1975 (one would expect that exactly 25 percent scored at the 75th or higher in 1975), 42 percent scored less than a comparable score in 1975 at lower than the 50th percentile (one would expect 50 percent), and so forth. This section will discuss some of the more interesting findings of these tables. Again note that only three tests plus pull-ups and flexed-arm hang can be compared between these two years.

It is interesting to note that, in each of these tables, both in the boys and in the girls results, a much larger percentage scored below the 50th percentile on each test than scored above the 50th percentile. In other words, the 1985 scores are skewed quite heavily towards the low side of the percentiles.

Percentages above the 50th percentile are about what one would expect, close to or slightly greater than the 1975 scores for the 50th, 75th and 85th on the average. Note the increased percentage of scores below the 25th percentile (below the expected 25%) for most of the girls scores as well as many of the boys.

One might observe that the decline in scores revealed by previous tables is much more dramatically noted in these tables, i.e., percentage of students expected to score above or at the 50th percentile for 1975 is close to what one might expect, but the larger percentages than expected scoring below the 50th and the 25th are quite discouraging. We present these tables as further evidence of a slide in physical performance in 1985 as compared with 1975.

4.9. *Comparison of Raw Scores at Selected Percentiles, 1975-1985.* Table 4.4 presents the raw scores at the 85th, 75th, 50th and 25th percentile ranks for each test by sex and age. These are similar tables to the above,—the difference is that raw scores instead of percentages of respondents are reported.

It is interesting to note that, in each test, both boys and girls scores are practically identical at each percentile rank when the 1985 and 1975 scores are compared. This illustrates an interesting trend, i.e., it is not the scores that are getting poorer, there is an increasing number of students that are getting poorer scores than in 1975. There are some exceptions to this, but in general, the scores in 1985 are also lower than scores in comparable percentile ranks in 1975. Most of these differences are negligible, however.

4.10. *Distribution of Students Qualifying for Presidential Award or 85th Percentile or Higher on Other Test Combinations.* The following paragraphs refer to Tables 4.5 and 4.6 which illustrate the number of boys and the number of girls who finished in the 85th percentile or higher on all six tests in their modules, or on five, four, three, two or zero tests. Note that the sample n is presented along with a percentage and a projection to the population N. As an example, in Table 4.5, boys aged 6 or less, there were 178 out of 374 who did not score in the 85th percentile or higher on any of their six tests (47.6%). A statistical inference to the population results in a projection of 1,190,000 boys in this category.

A further explanation of the parameters of these two tables is germane. The population estimate for 5-6 year old boys was 2,500,000, for boys 17 and older 3,000,000, whereas for ages seven through 16, 1,500,000. These are reported in the last column. Note that the original population estimate for boys was 20,500,000; these estimates were obtained by allocating each grade into the population total proportionately. Some error in the estimate of the population, therefore, is evident, as in any sample inference. We conclude, however, that these numbers are good estimates of the numbers existing in the population.

TABLE 4.3

PERCENT OF BOYS AND GIRLS IN 1985 SCORING AT OR GREATER THAN (>) OR LESS THAN (<) 25TH, 50TH, 75TH AND 85TH PERCENTILE SCORES IN 1975

Pull-Ups, Boys

Percentile in 1975	< or >	Percent in 1985 Scoring By Age							
		10-	11	12	13	14	15	16	17+
85th	<	16%	17%	16%	15%	17%	11%	12%	18%
75th	<	32%	22%	31%	29%	28%	25%	17%	28%
50th	<	58%	41%	47%	46%	50%	46%	45%	55%
50th	>	42%	59%	53%	54%	50%	54%	55%	45%
25th	>	27%	34%	28%	25%	30%	27%	28%	22%

Flexed Arm Hang, Girls

Percentile in 1975	< or >	Percent in 1985 Scoring By Age							
		10-	11	12	13	14	15	16	17+
85th	<	14%	10%	12%	15%	14%	26%	21%	16%
75th	<	21%	14%	17%	24%	20%	34%	30%	25%
50th	<	45%	36%	40%	46%	47%	57%	49%	48%
50th	>	55%	64%	60%	54%	53%	43%	51%	52%
25th	>	27%	29%	32%	29%	27%	11%	32%	30%

TABLE 4.3 (cont'd)

PERCENT OF BOYS AND GIRLS IN 1985 SCORING AT OR GREATER THAN (>) OR LESS THAN (<) 25TH, 50TH, 75TH AND 85TH PERCENTILE SCORES IN 1975

Standing Long Jump. Boys

Percentile in 1975	< or >	Percent in 1985 Scoring By Age							
		10-	11	12	13	14	15	16	17-
85th	<	16%	21%	18%	17%	27%	21%	16%	17%
75th	<	29%	33%	26%	3[illegible]%	36%	38%	26%	28%
50th	<	48%	53%	50%	57%	57%	53%	51%	56%
50th	>	52%	47%	50%	43%	43%	47%	49%	44%
25th	>	30%	23%	29%	20%	19%	25%	27%	19%

Standing Long Jump. Girls

Percentile in 1975	< or >	Percent in 1985 Scoring By Age							
		10-	11	12	13	14	15	16	17-
85th	<	9%	11%	17%	15%	10%	17%	19%	12%
75th	<	17%	21%	26%	24%	22%	26%	29%	20%
50th	<	38%	44%	54%	49%	45%	43%	51%	48%
50th	>	62%	56%	46%	51%	55%	57%	49%	52%
25th	>	28%	28%	25%	31%	30%	32%	24%	29%

TABLE 4.3 (cont'd)

PERCENT OF BOYS AND GIRLS IN 1985 SCORING AT OR GREATER THAN (>) OR LESS THAN (<) 25TH, 50TH, 75TH AND 85TH PERCENTILE SCORES IN 1975

50-Yard Dash, Boys

Percentile in 1975	< or >	Percent in 1985 Scoring By Age							
		10-	11	12	13	14	15	16	17-
85th	<	14%	11%	16%	18%	14%	12%	20%	11%
75th	<	18%	21%	31%	22%	27%	22%	33%	21%
50th	<	34%	38%	49%	53%	53%	49%	47%	42%
50th	>	66%	62%	51%	47%	47%	51%	53%	58%
25th	>	33%	35%	27%	27%	23%	25%	27%	30%

50-Yard Dash, Girls

Percentile in 1975	< or >	Percent in 1985 Scoring By Age							
		10-	11	12	13	14	15	16	17-
85th	<	8%	8%	14%	13%	10%	10%	14%	10%
75th	<	13%	20%	23%	23%	17%	21%	23%	20%
50th	<	39%	40%	43%	52%	39%	42%	39%	37%
50th	>	61%	60%	57%	48%	61%	58%	61%	63%
25th	>	39%	30%	31%	28%	35%	39%	37%	42%

TABLE 4.3 (cont'd)

PERCENT OF BOYS AND GIRLS IN 1985 SCORING AT OR GREATER THAN (>) OR LESS THAN (<) 25TH, 50TH, 75TH AND 85TH PERCENTILE SCORES IN 1975

Shuttle Run, Boys

Percentile in 1975	< or >	Percent in 1985 Scoring By Age							
		10-	11	12	13	14	15	16	17+
85th	<	17%	15%	21%	20%	20%	23%	34%	25%
75th	<	22%	24%	30%	33%	32%	33%	47%	38%
50th	<	40%	41%	52%	56%	59%	58%	69%	69%
50th	>	60%	59%	48%	44%	41%	42%	31%	31%
25th	>	36%	37%	22%	22%	20%	22%	14%	14%

Shuttle run, Girls

Percentile in 1975	< or >	Percent in 1985 Scoring By Age							
		10-	11	12	13	14	15	16	17+
85th	<	16%	14%	17%	12%	14%	21%	25%	16%
75th		19%	22%	27%	23%	19%	28%	35%	27%
50th		39%	48%	53%	52%	40%	49%	59%	55%
50th	>	61%	52%	47%	48%	60%	51%	41%	45%
25th	>	40%	35%	29%	23%	24%	24%	19%	20%

TABLE 4.4

COMPARISON OF RAW SCORES OF 25TH, 50TH, 75TH AND 85TH PERCENTILES BETWEEN 1975-1985 BY SEX AND AGE

PULL-UPS BOYS

BOYS								
Percentile	Age							
and year	10-	11	12	13	14	15	16	17+
1975--85th	5	5	6	7	9	11	11	12
1985--85th	6	6	7	7	10	11	11	13
1975--75th	3	4	4	5	7	9	10	10
1985--75th	4	4	5	6	8	10	10	11
1975--50th	1	2	2	3	4	6	7	7
1985--50th	2	2	2	3	5	6	7	8
1975--25th	0	0	0	1	2	3	4	4
1985--25th	0	0	0	1	2	3	4	5

FLEXED ARM HANG, GIRLS

GIRLS								
Percentile	Age							
and year	10-	11	12	13	14	15	16	17+
1975--85th	24	24	23	21	26	25	20	22
1985--85th	22	20	21	21	25	28	24	24
1975--75th	18	20	18	16	21	18	15	17
1985--75th	16	14	14	16	18	18	18	18
1975--50th	9	10	9	8	9	9	7	8
1985--50th	8	7	7	8	9	7	7	7
1975--25th	3	3	3	3	3	4	3	3
1985--25th	3	3	2	3	3	3	2	2

TABLE 4.4 (cont'd)

SHUTTLE RUN, BOYS

Percentile and year	BOYS Age 10-	11	12	13	14	15	16	17+
1975--85th	10.4	10.1	10.0	9.7	9.3	9.2	9.1	9.0
1985--85th	10.3	10.0	9.8	9.5	9.1	9.0	8.7	8.7
1975--75th	10.6	10.4	10.2	10.0	9.6	9.4	9.3	9.2
1985--75th	10.7	10.4	10.0	9.8	9.4	9.2	8.9	8.9
1975--50th	11.2	10.9	10.7	10.4	10.1	9.9	9.9	9.6
1985--50th	11.5	11.1	10.6	10.2	9.9	9.7	9.4	9.4
1975--25th	12.0	11.5	11.4	11.0	10.7	10.4	10.5	10.4
1985--25th	12.4	12.0	11.2	10.8	10.5	10.2	10.0	9.9

SHUTTLE RUN, GIRLS

Percentile and year	GIRLS Age 10-	11	12	13	14	15	16	17+
1975--85th	10.9	10.5	10.5	10.2	10.1	10.2	10.4	10.1
1985--85th	10.8	10.5	10.4	10.2	10.1	10.0	10.1	10.0
1975--75th	11.1	10.8	10.8	10.5	10.3	10.4	10.6	10.4
1985--75th	11.3	10.8	10.7	10.5	10.5	10.3	10.4	10.3
1975--50th	11.8	11.5	11.4	11.2	11.0	11.0	11.2	11.1
1985--50th	12.1	11.5	11.3	11.1	11.2	11.0	10.9	11.0
1975--25th	12.5	12.1	12.0	12.0	12.0	11.8	12.0	12.0
1985--25th	13.1	12.5	12.1	11.8	11 9	11 7	11.7	11 7

TABLE 4.4 (cont'd)

50-YARD DASH. BOYS

BOYS								
Percentile and year	Age 10-	11	12	13	14	15	16	17+
1975--85th	7.7	7.4	7.1	6.9	6.5	6.3	6.3	6.1
1985--85th	7.7	7.4	7.0	6.8	6.5	6.3	6.2	6.1
1975--75th	7.8	7.6	7.4	7.0	6.8	6.5	6.5	6.3
1985--75th	8.0	7.6	7.3	7.0	6.7	6.5	6.3	6.3
1975--50th	8.2	8.0	7.8	7.5	7.2	6.9	6.7	6.6
1985--50th	8.4	8.1	7.8	7.4	7.1	6.9	6.7	6.6
1975--25th	8.9	8.6	8.3	8.0	7.7	7.3	7.0	7.0
1985--25th	9.0	8.9	8.3	8.0	7.6	7.2	7.0	7.0

50-YARD DASH. GIRLS

GIRLS								
Percentile and year	Age 10-	11	12	13	14	15	16	17+
1975--85th	7.8	7.5	7.4	7.2	7.1	7.1	7.3	7.1
1985--85th	8.0	7.7	7.4	7.2	7.2	7.2	7.3	7.2
1975--75th	8.0	7.9	7.6	7.4	7.3	7.4	7.5	7.4
1985--75th	8.2	8.0	7.6	7.4	7.4	7.4	7.5	7.5
1975--50th	8.6	8.3	8.1	8.0	7.8	7.8	7.9	7.9
1985--50th	8.8	8.5	8.2	7.9	8.0	7.9	8.0	8.2
1975--25th	9.1	9.0	8.7	8.5	8.3	8.2	8.3	8.4
1985--25th	9.4	9.1	8.9	8.5	8.5	8.5	8.6	8.7

TABLE 4.4 (cont'd)

STANDING LONG JUMP, BOYS

BOYS								
Percentile and year	Age 10-	11	12	13	14	15	16	17-
1975--85th	5' 8"	5'10"	6' 1"	6' 8"	6'11"	7' 5"	7' 9"	8' 0"
1985--85th	5' 9"	6' 0"	6' 3"	6' 9"	7' 4"	7' 8"	7'10"	8' 1"
1975--75th	5' 4"	5' 7"	5'11"	6' 3"	6' 8"	7' 2"	7' 6"	7' 9"
1985--75th	5' 6"	5' 9"	6' 0"	6' 6"	7' 0"	7' 4"	7' 7"	7'10"
1975--50th	4'11"	5' 2"	5' 5"	5' 9"	6' 2"	6' 8"	7' 0"	7' 2"
1985--50th	4'11"	5' 3"	5' 5"	6' 0"	6' 4"	6' 9"	7' 1"	7' 4"
1975--25th	4' 6"	4' 8"	5' 0"	5' 2"	5' 6"	6' 1"	6' 6"	6' 6"
1985--25th	4' 5"	4' 9"	5' 0"	5' 4"	5' 9"	6' 1"	6' 6"	6'10"

STANDING LONG JUMP, GIRLS

GIRLS								
Percentile and year	Age 10-	11	12	13	14	15	16	17-
1975--85th	5' 5"	5' 7"	5' 9"	6' 0"	6' 3"	6' 1"	6' 0"	6' 3"
1985--85th	5' 3"	5' 6"	5'10"	6' 0"	6' 2"	6' 2"	6' 2"	6 2"
1975--75th	5' 2"	5' 4"	5' 6"	5' 9"	5'11"	5'10"	5' 9"	6' 0"
1985--75th	5' 0"	5' 4"	5' 7"	5' 9"	5'10"	5'11"	5'11"	6' 0"
1975--50th	4' 8"	4'11"	5' 0"	5' 3"	5' 4"	5' 5"	5' 3"	5' 5"
1985--50th	4' 6"	4' 9"	5' 1"	5' 3"	5' 3"	5' 3"	5' 4"	5' 5"
1975--25th	4' 1"	4' 4"	4' 6"	4' 9"	4'10"	4'11"	4' 9"	4 11"
1985--25th	4' 1"	4' 4"	4' 7"	4' 8"	4' 9"	4' 9"	4'10"	4 10"

TABLE 4.5

PRESIDENTIAL AWARD: NUMBER, PERCENT OF SAMPLE AND PROJECTED NUMBER OF BOYS IN POPULATION SCORING AT 85TH PERCENTILE OR HIGHER ON 0, 1, 2, 3, 4, 5 OR 6 TESTS, 1985

AGE	SAMPLE & PERCENT PROJECTED N	Number of Tests at 85th Percentile or Above							TOTALS
		0	1	2	3	4	5	6	
6-	#	170	101	41	25	6	0	1	344
	PCT.	47.6	27.8	16.3	6.7	2.1	0.0	0.3	100.0
	PROJ N	1.190 000	675.000	407.500	167.500	52.500	0	7 500	2.500.000
7	#	212	173	80	42	14	4	1	426
	PCT.	49 1	37 2	13 0	6.6	3.2	0.9	0.2	100.0
	PROJ N	736.500	600.000	287.500	99.000	33.000	13.500	3.000	1.500 000
8	#	340	104	94	51	21	6	2	706
	PCT.	49.2	26.1	13.2	7.2	3.0	0 8	0.3	100 0
	PROJ. N	739.500	391.500	199.500	100.000	45.000	13.000	6.500	1.500 000
9	#	301	103	91	47	30	9	2	652
	PCT.	46.2	27.9	14.0	7 2	3.1	1.4	0.2	100 0
	PROJ. N	693.000	418.500	210.000	100.000	46.500	21.000	6.500	1.500.000
10	#	231	164	80	49	10	4	1	655
	PCT.	50.5	25.0	12.1	7.5	3.7	0.9	0.2	100 0
	PROJ. N	757.000	375.000	196.500	113.500	60.500	13.500	3.000	1.500.000
11	#	297	173	105	51	20	10	1	765
	PCT.	51.9	23.6	13.7	6.7	2.7	1.3	0.1	100 0
	PROJ. N	771.500	339.000	205.500	99.000	55.500	19.500	1.500	1.500.000
12	#	421	191	116	69	27	10	1	815
	PCT.	51.7	23.6	16.2	6 0	3.3	1.2	0.1	100 0
	PROJ. N	775.500	351.000	213.00M	90.000	49.500	18.000	1.500	1.500.000
13	#	463	231	130	69	19	16	0	935
	PCT	49.6	24.7	14.0	7 4	2.0	1.7	0 0	100 0
	PROJ. N	761.000	378.500	222.000	111.000	30.000	25.500	0	1.500 000
14	#	575	289	159	75	30	10	1	1.139
	PCT	50.5	25.4	14.0	6.6	2.6	0.9	0.1	100 0
	PROJ. N	757.500	381.000	210.000	100.500	39.000	13.500	1 500	1.500.000
15	#	504	310	152	80	15	6	0	1.077
	PCT.	46.8	28.5	14.1	7 4	1.4	0 7	0 0	100 0
	PROJ. N	702.000	442.500	211.500	111.000	21.000	10.500	0	1.500 000
16	#	422	230	141	57	10	5	0	874
	PCT.	48 6	26 3	16 1	6.5	2 1	0 6	0 0	100 0
	PROJ N	726.000	396.500	241.500	97.500	31.500	9 000	0	1 500.000
17+	#	395	267	132	53	14	2	1	863
	PCT	45.9	30.9	15 3	6 0	1.6	0 2	0 1	100 0
	PROJ. N	1.374.000	927 000	459.000	180 000	48.000	6.000	3.000	3 000 000
TOT	#	4.836	2.503	1.363	667	232	60	11	9 678
	PCT.	49 9	25.9	14 1	6.7	2.4	0 9	0 1	100 0
	PROJ N	10.229.500	5.309.500	2.990 500	1.373 500	492.000	186 500	20 500	20 500 000

TABLE 4.6

PRESIDENTIAL AWARD: NUMBER, PERCENT OF SAMPLE AND PROJECTED NUMBER OF GIRLS IN POPULATION SCORING AT 85TH PERCENTILE OR HIGHER ON 0, 1, 2, 3, 4, 5 OR 6 TESTS, 1985

AGE	SAMPLE & PERCENT PROJECTED	Number of Tests at 85th Percentile or Above							TOTALS
		0	1	2	3	4	5	6	
	#	195	113	68	23	7	6	1	391
4-	PCT.	49.9	28.9	13.2	13.1	1.8	1.0	0.2	100 0
	PROJ. #	1.247.500	722.500	307.500	147.500	45.000	25.000	7 500	2 500 000
	#	295	150	90	42	14	4	0	604
7	PCT.	48.8	24.2	14.9	7 1	2.2	0.7	0.0	100 0
	PROJ. #	723.000	393.000	223.500	104.500	34.500	10.500	0	1.500.000
	#	331	165	90	41	24	8	0	669
8	PCT.	48.8	27.7	13.5	6.1	3.6	1.2	0.0	100 0
	PROJ. #	726.000	415.500	202.500	91.530	54.000	18.000	0	1.500.000
	#	300	141	82	44	16	7	2	612
9	PCT.	49.0	26.2	13.4	7 2	2.6	1.1	0.3	= 100 0
	PROJ. #	735.000	374.500	201.000	108.000	39.000	16.500	4.500	1 500 000
	#	235	137	87	46	22	7	1	636
10	PCT.	36.9	22.9	13.2	7.3	3.5	1.1	0.2	100 0
	PROJ. #	762.500	356.500	198.000	109.500	52.500	16.500	3.000	1.500 000
	#	393	182	98	47	24	13	3	754
11	PCT.	52.0	24.1	13.9	8.2	3.4	2.0	0 2	100 0
	PROJ. #	780.000	361.500	178.500	93.000	51.000	30.000	4.500	1.500.000
	#	399	187	111	43	18	14	3	788
12	PCT.	50.8	23.8	14.1	5.2	2.8	1.8	0.4	100 0
	PROJ. #	762.000	287.000	211.500	79.500	57.000	27.000	6.000	1.500 000
	#	543	233	131	70	28	12	6	995
13	PCT.	54.5	21.6	13.2	7 0	2.8	1.1	0.6	100 0
	PROJ. #	817.500	324.000	162.000	105.000	42.000	19.500	9.000	1.500 000
	#	621	286	139	71	36	12	6	1 182
14	PCT.	52.2	24.3	11.7	8.0	3.2	1.0	0 3	100 0
	PROJ. #	799.500	374.500	175.500	98.000	48.000	15.000	4.500	1.500 000
	#	561	262	142	74	33	13	1	1 085
15	PCT.	51.7	24.2	13.1	6 8	3.1	1.1	0 1	100 0
	PROJ. #	775.500	363.000	196.500	102.000	24 500	16.500	1.500	1.500 000
	#	340	163	104	57	16	8	2	711
16	PCT.	47 8	25.7	14.6	8.0	2.3	1 1	0 4	100 0
	PROJ. #	717 000	385.500	219.000	120.000	34.500	16.500	6 000	1.500 000
	#	234	137	94	36	12	5	0	558
17+	PCT.	43.5	28.1	16 8	6 5	2 2	0 9	0 3	100 0
	PROJ. #	1.305.000	843.000	504.000	195 000	66 000	27 000	0	3 000 000
	#	4 726	2.249	1 198	596	268	109	23	9 179
TOT	PCT	51.6	24.5	13 1	6 5	2.9	1.2	0 3	100 0
	PROJ. #	10.578.000	5 022.500	2.685.500	1.332.500	594 500	246 000	61 500	20 500 000

Note also that, in both Tables 4.5 and 4.6, these data reflect the results of students in whatever test module they were randomly assigned. Due to the larger number of tests in the survey (nine) it was not possible to assign all nine to each student. Each student, therefore, completed a different set of six tests than 1/3 of the other students in the sample. It was not possible to compare students to the original six tests in the AAHPERD test battery because none of the modules contained those six. We conclude that these numbers, therefore, reflect that given any six tests at random, including the AAHPERD test, a comparable number of students would score in their age/sex category. In other words, assuming that subjects were given the AAHPERD test only, we would expect similar percentages.

Boys. It is interesting to note that only 11 boys out of 9,678 scored in the 85th percentile on any six test combinations (0.1%). Our projection, illustrated in the bottom row, suggests that only 20,500 boys in the United States would qualify for a Presidential Physical Fitness Award. Note that the numbers increase dramatically at the three test levels, reflecting a population estimate of 1,373,500 boys. It is also interesting to note that 10,229,500 boys (49.9% or half) failed to score on any test at the 85th percentile.

Girls. Table 4.6 reports the girls' results on their six test modules. The girls results disclosed what some would consider an interesting statistic, —more girls than boys scored in the 85th percentile or higher than boys. The population inferences are that 61,500 girls qualified whereas only 20,500 boys would have qualified. Girls also reported a slightly higher percentage than boys when four or five tests were considered.

More girls than boys, however, with one exception (one test), failed to score at the 85th percentile or higher on the remaining combinations.

Summary. Admittedly, one could conclude that the failure of a higher percentage of students to finish at the 85th percentile or higher on six tests resulted from the fact that the performance of our school children is sadly lacking or that scoring at that level is a significant achievement.

Note, however, that the intercorrelations of all nine tests (Appendix B) are all in the order of 0.40 or less; only a few, as previously reported are in the 0.60 range. Therefore, one might infer that success in one test does not, on the average, infer a high score on all or any of the other tests. The original committee of the Research Council, which constructed the AAHPERD battery, chose tests which would indicate different aspects of fitness and performance. So, one could also reach the conclusion that, to attain the 85th percentile or higher on all six tests, requires a relatively excellent performance. Once again, we reemphasize that, if so few students failed to qualify at the 85th percentile or higher on any six tests in this battery, we would expect similar results if the original six were administered.

4.11. *Intercorrelations of All Tests by Sex and Age 1985.* The Pearson 'r' correlations for all tests by sex and age are presented in Appendix B.

Note that in each age and sex grouping practically all of the intercorrelations are quite low, that is, below 0.50. Only a few of these correlations are 0.40 or slightly higher. This is what one would expect in a test battery, low intercorrelations between the separate tests by sex and age and relatively high reliability. These intercorrelation tables are the first time these statistics have been surveyed as a result of a national probability sample below age 10 (grade 5).

The highest correlations, ranging from 0.40 to 0.66 occur in the relationships between flexed-arm hang and pull-ups, mile run and two mile walk, shuttle run and 50-yard dash and the shuttle run and long jump. Each of these pairs measures some very similar abilities, notably speed and leg strength and upper arm strength. It is interesting to note, however, that even with many of the boys' pull-ups and flexed-arm hang correlations around the 0.60 range, this only explains 36 percent of the variance between these two tests. It is obvious that they measure different kinds of strength, both static and dynamic. The 50 yard dash and shuttle run, and the mile run and two mile walk respectively, only account for about 17 percent of the

variance between these pairs, even though the coefficients are in the order of the low forties.

4.12 *Sample Means and Cluster Standard Errors 1985.* The n, mean and standard error for each test by age and sex is reported in Appendix A.

Note that the mean and n for each test, age and sex will be identical to the simple random sample descriptive statistics reported in Appendix C. The standard errors, however, are calculated from cluster sample statistics, and not from simple random sample procedures. If one is interested in the sample variance for each test these are reported in Appendix C. These are the variances from simple random samples and should not be confused with cluster sample standard errors or with simple random sample standard errors.

Note that each student was not selected from a list, where each would be a separate and independent selection. Students were selected from classrooms. Each classroom represents a "cluster" of students, and since the clusters tend to be more homogeneous in traits than simple random sample estimates, the variance of the estimates is calculated differently. Cluster sample variances can range approximately two to three times those of simple random sample variance of the mean estimates.

CHAPTER 5

SUMMARY AND CONCLUSIONS

5.1 Summary. There were three primary objectives motivating this research: (1) assess the physical fitness status of American public school children and youth ages 6-17, and establish national norms for this age group by sex and age, in five percent increments, (2) compare these data with the results of three similar national studies completed in 1958, 1965 and 1975, and, (3) review and modify, if necessary, standards for the President's Council on Physical Fitness and Sports *Presidential Physical Fitness Award* for school children.

A national probability sample of 18,857 public school children, ages 6-12 was selected, resulting in data from 9,678 boys and 9,179 girls from 32 states, 52 school districts and 161 schools. These children and youth were randomly administered six tests of physical fitness from a battery of nine tests. The sample was allocated so that approximately 750 boys and 750 girls would be selected in each age group 6-17+. The data have been collected and analyzed, and within the restrictions of the survey the following conclusions seem justified.

5.2 *Conclusions.*

1. The physical fitness levels of public school children, ages 6-17, as measured by the nine tests reported, revealed no significant overall changes when compared with previous years. In conclusion, the physical performance of children and youth in 1985 was not much different from that of youth in 1975. Extrapolated to the entire population, the study data show there is still a low level of performance in important components of physical fitness by millions of our youth.

2. There was a larger percentage of both boys and girls who scored lower than the 50th and the 25th percentiles on the same tests than in 1975. While mean scores, in many cases, do not disclose statistically significant differences on many tests, the percentage of youth performing progressively worse is alarming.

3. There was a low level of performance by large numbers of boys and girls on cardiorespiratory endurance tests. Low levels in this component are related to early fatigue in physical activities. High levels of cardiorespiratory endurance have been shown to be related to a reduction in heart disease and to a longer life span.

4. Girls either declined or did not continue to improve after age 14. There was a definite drop in performance at this age which could indicate not having opportunities to participate in physical education classes, a lack of interest or awareness of the value of physical education and exercise in developing different aspects of fitness, or that many physical education classes at the high school level do not emphasize, develop or offer fitness activities. Flexibility was the one aspect of fitness in which girls continued to improve through the age range 6-17, and in which they were significantly more fit than boys. A trunk flexibility test was not administered in the 1958, 1965, or 1975 surveys so this component could not be compared with previous years.

5. The low levels of trunk flexibility revealed by boys indicates a good chance of developing back problems in later life. Low back problems are generally caused by either weak abdominals, tight hamstrings or both, and is one of this country's leading problems in the workplace.

6. Upper arm and shoulder muscle girdle strength and endurance for both boys and girls was poor, although not worse than 1965 or 1975. It remains a significant weakness in our youth, boys as well as girls. Many have insufficient strength to handle their own body weight in case of emergency and were judged as being often unable to carry on daily work or physically demanding recreational activities

successfully or safely. Upper arm and shoulder muscle girdle strength and endurance for both men and women has previously been identified as a major physical weakness for those who served in two world wars; the improvement of this component of fitness still waits to be addressed.

7. Qualification standards for the Presidential Physical Fitness Award (PPFA) are the 85th percentile on all test items by sex and age. A limited number of youth scored at the 85th percentile or higher on each of six tests. We can hypothesize that this manifests a lack of interest or motivation towards achieving this goal, or an inability to physically qualify at that level.

5.3 *Discussion.* This study supports a growing volume of both evidence and opinion that increased emphasis is required to improve the levels of youth physical fitness. Physical fitness has been found to be significantly related to the ability to do physical activities such as household work, work, sport, dance, and a capacity to meet emergency situations and to improved health.

Every youth serving agency, institution and organization at all levels, federal, state and regional, in both the private and public sector, should look critically at their responsibilities to improve youth fitness. Families can also provide encouragement and motivation towards good fitness habits. Youth must be self-motivated to develop physically and learn how to maintain at least a minimum level of fitness throughout life.

It is suggested that a great challenge for the 1990's and into the 21st century is the revitalization of school physical education programs which provide opportunities to develop fitness components, learn important concepts in exercise science, and experience fitness tests on a serial basis which provide a profile of the youth's fitness, relationships to peer age and sex group, and changes in fitness achievement.

APPENDIX A

Means and Standard Errors for Boys and Girls (Cluster Statistics), 1985

TABLE 1

YOUTH FITNESS TEST DATA 1985, BOYS

Means and Standard Errors

(Cluster Sample Estimates)

Test		Age -6	7	8	9	10	11	12	13	14	15	16	17+
1. Pull-ups	x	1.3	1.8	2.3	2.6	2.8	2.8	3.2	3.8	5.3	6.4	7.2	8.3
(no.)	S.E.	0.25	0.23	0.26	0.31	0.31	0.30	0.29	0.31	0.33	0.35	0.38	0.41
	n	241	398	468	413	427	594	577	605	725	643	535	575
2. Flexed	x	7.9	10.6	12.3	13.1	16.0	16.3	15.8	18.1	27.7	33.4	31 1	31.5
Arm Hang	S.E.	1.04	1.02	1.06	1.30	1.66	1.51	1.44	1.70	2.86	1.96	2.12	1.94
(sec)	n	242	418	441	406	397	481	490	546	630	561	459	402
3 Sit-ups	x	22.6	27.2	30.5	32.0	35.2	36.8	40.3	42.5	45.3	45.5	44.7	44.0
(no.)	S.E.	1.33	0.95	0.96	0.94	0.98	1.04	0.93	0.86	0.77	0.77	0.86	0.91
	n	228	385	447	451	445	370	476	636	814	840	639	597
4 Standing	x	44.6	47.4	51.9	56.0	59.2	63.0	65.5	71.0	76.3	80.7	83 8	87.1
Long Jump	S.E.	1.11	0.74	0.77	0.79	0.92	0.84	0.86	0.87	0.91	0.89	0.97	0 99
(in)	n	262	441	477	419	416	541	531	585	646	592	530	482
5. Shuttle	x	13.5	13.0	12.4	12.2	11.7	11.2	10.7	10.4	10 1	9.9	9 6	9.6
Run	S.E.	0.19	0.17	0.14	0.15	0.14	0.11	0.09	0.08	0.10	0.10	0.11	0.10
(sec.)	n	225	382	458	407	430	596	579	608	723	642	527	586
6. Mile	x	13' 9"	12' 7"	11'25"	10'47"	10'20"	9'56"	9'15"	8'42"	8'15"	7'56"	7'45"	7'27"
Run/Walk	S E.	23.99	17 02	16.20	14 49	16.67	14.49	12.49	11.74	10 15	10.02	11.19	9.21
(min.sec)	n	232	397	417	402	375	484	493	553	644	595	517	461
7 50-Yard	x	10.2	9.8	9.3	8 8	8 6	8.34	7 8	7 5	7.2	7.0	6 8	6.7
Dash	S.E	0.17	0.12	0.10	0.09	0 10	0.09	0.07	0.07	0.07	0.06	0 07	0.06
(sec.)	n	231	397	470	397	416	580	581	608	703	622	498	548
8 Sit &	x	0.6	0 7	0 2	0.4	0.9	0 9	0 4	0.2	1.1	1.8	2.5	2 8
Reach	S E	0 40	0 29	0.28	0.31	0.37	0.41	0 34	0 28	0 26	0.28	0.32	0.34
(in)	n	213	364	422	430	410	348	467	618	784	753	551	549
9 Two Mile	x	33'58"	33'51"	32'50"	31'44"	30'50"	30' 1"	28'49"	28'54"	28'41"	28'54"	28'43"	28'44"
Walk	S.E	59 11	44 66	38.33	34.16	38.86	35 42	24 44	21.83	21 61	20.06	20 50	20.06
(min sec)	n	131	278	336	318	301	257	349	457	512	530	452	449
Total in age group		374	636	706	652	655	765	815	935	1139	1077	874	863

TABLE 2

YOUTH FITNESS TEST DATA 1985, GIRLS

Means and Standard Errors

(Cluster Sample Estimates)

Test		Age -6	7	8	9	10	11	12	13	14	15	16	17+
1. Pull-ups	x	0.7	0.8	1.0	1.0	1.0	1.2	1.0	0.8	0 9	0.7	0.7	0.8
(no.)	S.E.	0.17	0.17	0.19	0.18	0.17	0.23	0.19	0.19	0.22	0.15	0.16	0.28
	n	245	355	417	364	419	516	484	490	593	342	340	276
2. Flexed	x	7.1	9.3	9.7	10.7	12.5	10.9	11.0	11.0	12.8	13.3	12.4	12.1
Arm Hang	S.E.	0.95	1.06	0.94	1.17	1.66	1.27	1.20	0.94	1.10	1.36	1.51	1.64
(sec.)	n	278	381	439	395	404	556	505	627	691	602	410	313
3. Sit-ups	x	22.9	25.4	28.7	30.0	30.2	32.4	34.9	36.4	37.4	36.8	35.5	34.1
(no.)	S.E.	1.22	0.94	0.93	0.98	0.94	1.12	0.91	0.88	0.73	0.78	0.95	1.04
	n	219	403	411	409	428	323	462	649	780	799	518	395
4. Standing	x	40.6	43.3	47 4	50.2	54.2	57.5	60.8	62.5	63 7	63.6	63.8	64.4
Long Jump	S.E.	0.82	0.77	0 71	0.83	0.85	0.76	0.86	0.79	0 82	0.85	1.01	1.24
(in)	n	289	405	465	408	424	559	509	620.	[illegible]7	584	415	311
5. Shuttle	x	13 9	13.5	13.1	12.6	12.2	11.7	11.4	11.3	11.4	11.1	11.1	11.1
Run	S.E.	0.18	0.18	0.15	0.17	0.14	0.12	0.09	0.10	0 12	0 09	0.11	0.14
(sec.)	n	248	364	429	381	445	605	545	625	786	695	441	375
6. Mile	x	13'49"	13'10"	12"43"	12'13"	11'37"	11'18"	10 58"	10'34"	10'34"	10'33"	11'12"	10'50"
Run/Walk	S.E	21.96	16.90	15 26	17.29	15.20	13.60	15.37	14.21	13.01	14 14	19.93	20.21
(min.sec.)	n	234	347	403	377	366	518	476	590	628	533	366	267
7 50-Yard	x	10 8	10.2	9.7	9.2	8.9	8.6	8.4	8.1	8 1	8.0	8.1	8.2
Dash	S.E.	0.20	0.13	0.12	0.11	0.10	0.09	0 09	0.08	0.07	0.07	0.10	0.11
(sec.)	n	236	370	435	377	439	594	541	614	756	666	419	344
8. Sit &	x	2 4	2.2	2 1	2.42	2.7	3.3	3.6	3.8	4.4	4.7	5.4	4.6
Reach	S.E.	0.44	0.30	0 28	0.35	0.35	0.46	0.35	0.29	0.26	0 26	0.33	0.41
(in)	n	197	369	395	393	402	304	430	633	749	735	451	334
9 Two Mile	x	35'14"	35'46"	34'39"	33'11"	31'58"	32' 8"	30'25"	29'59"	30'10"	30'26"	30'42"	30" 7"
Walk	S E	69 32	45.08	39 99	37.57	39.00	38.62	31.42	23.26	18.83	16 71	20.42	22.24
(min.sec.)	n	131	275	317	291	322	269	393	541	586	629	402	294
Total in age group		391	604	669	612	658	754	786	995	1183	1085	711	558

APPENDIX B

Intercorrelations of Nine Tests by Age and Sex, 1985

INTERCORRELATIONS FOR -6 YEAR OLDS

BOYS

Variable	Flexed Arm Hang	Pull-ups	Sit-ups	Sit & Reach	Standing Long Jump	Shuttle Run	50-Yard Dash	Mile Run/Walk
Pull-ups	0.5674							
Sit-ups	0.3481	0.3461						
Sit & Reach	0.1093	0.0171	0.0842					
Standing Long Jump	0.2686	0.4553	0.2977	0.1422				
Shuttle Run	0.3067	0.1990	0.4086	0.1998	0.4102			
50-Yard Dash	0.2146	0.2770	0.4215	0.0361	0.4596	0.6794		
Mile Run/Walk	0.3782	0.2240	0.3831	0.0430	0.2709	0.4250	0.5195	
Two Mile Walk	0.4054	0.0860	0.0877	0.0365	0.1257	0.1806	0.2387	0.5140

GIRLS

Variable	Flexed Arm Hang	Pull-ups	Sit-ups	Sit & Reach	Standing Long Jump	Shuttle Run	50-Yard Dash	Mile Run/Walk
Pull-ups	0.3607							
Sit-ups	0.3142	0.1531						
Sit & Reach	0.1952	0.1146	0.2514					
Standing Long Jump	0.3111	0.2697	0.2681	0.2946				
Shuttle Run	0.2057	0.1822	0.1127	0.0590	0.3682			
50-Yard Dash	0.4013	0.2046	0.1820	0.0097	0.4791	0.6244		
Mile Run/Walk	0.2417	0.0661	0.2697	0.0275	0.3093	0.2856	0 4963	
Two Mile Walk	0.2475	0.0352	0.1479	0.0695	0.1341	0.1101	0.4606	0 4231

INTERCORRELATIONS FOR 7 YEAR OLDS

BOYS

Variable	Flexed Arm Hang	Pull-ups	Sit-ups	Sit & Reach	Standing Long Jump	Shuttle Run	50-Yard Dash	Mile Run/Walk
Pull-ups	0.5246							
Sit-ups	0.2614	0.3843						
Sit & Reach	0.1374	0.2459	0.0579					
Standing Long Jump	0.2829	0.3225	0.3483	0.2078				
Shuttle Run	0.1970	0.1523	0.3779	0.0352	0.3647			
50-Yard Dash	0.3538	0.2717	0.3695	0.1613	0.5525	0.4473		
Mile Run/Walk	0.2889	0.1990	0.2586	0.0409	0.2713	0.1109	0 3124	
Two Mile Walk	0.2624	0.2199	0.0817	0.0323	0 3312	0 1645	0 3371	0 5492

GIRLS

Variable	Flexed Arm Hang	Pull-ups	Sit-ups	Sit & Reach	Standing Long Jump	Shuttle Run	50-Yard Dash	Mile Run/Walk
Pull-ups	0.4417							
Sit-ups	0.2979	0.2494						
Sit & Reach	0.1838	0 0732	0.1316					
Standing Long Jump	0 3022	0.3088	0.2862	0.2887				
Shuttle Run	0.1432	0.1867	0.3535	0.2448	0.2905			
50-Yard Dash	0.2740	0 2302	0.3075	0 2248	0 4813	0 5140		
Mile Run/Walk	0 2604	0.2196	0 0917	0.0378	0.2636	0 2643	0 3579	
Two Mile Walk	0.2074	0.1079	0 1301	0 1285	0.1822	0 0703	0 2161	0 585.

TABLE 1 (cont'd)
INTERCORRELATIONS FOR 8 YEAR OLDS

BOYS

Variable	Flexed Arm Hang	Pull-ups	Sit-ups	Sit & Reach	Standing Long Jump	Shuttle Run	50-Yard Dash	Mile Run/Walk
Pull-ups	0.5327							
Sit-ups	0.3675	0.3404						
Sit & Reach	0.0839	0.2692	0.2179					
Standing Long Jump	0.2742	0.4845	0.1481	0.1873				
Shuttle Run	0.2879	0.2246	0.3810	0.1841	0.5449			
50-Yard Dash	0.3291	0.3695	0.4887	0.1952	0.6408	0.5826		
Mile Run/Walk	0.3430	0.3457	0.1611	0.0712	0.2747	0.3747	0.5533	
Two Mile Walk	0.1516	0.2899	0.2471	0.0397	0.0947	0.0078	0.3116	0.4228

GIRLS

Variable	Flexed Arm Hang	Pull-ups	Sit-ups	Sit & Reach	Standing Long Jump	Shuttle Run	50-Yard Dash	Mile Run/Walk
Pull-ups	0.5130							
Sit-ups	0.4247	0.1586						
Sit & Reach	0.1751	0.1620	0.1225					
Standing Long Jump	0.2723	0.2560	0.2545	0.2741				
Shuttle Run	0.0565	0.1274	0.3225	0.0386	0.4143			
50-Yard Dash	0.2192	0.2271	0.2606	0.1274	0.4680	0.5628		
Mile Run/Walk	0.3106	0.2264	0.2708	0.1253	0.2897	0.2455	0.3543	
Two Mile Walk	0.2776	0.2305	0.1888	0.1342	0.2621	0.0253	0.0779	0.4200

INTERCORRELATIONS FOR 9 YEAR OLDS

BOYS

Variable	Flexed Arm Hang	Pull-ups	Sit-ups	Sit & Reach	Standing Long Jump	Shuttle Run	50-Yard Dash	Mile Run/Walk
Pull-ups	0.4383							
Sit-ups	0.3765	0.3716						
Sit & Reach	0.1154	0.1985	0.0445					
Standing Long Jump	0.3526	0.3838	0.3139	0.2409				
Shuttle Run	0.1387	0.1210	0.2849	0.0072	0.4031			
50-Yard Dash	0.3570	0.3329	0.3449	0.1567	0.6552	0.5109		
Mile Run/Walk	0.3472	0.3014	0.3471	0.0539	0.3785	0.1899	0.4762	
Two Mile Walk	0.1859	0.1557	0.1855	0.0836	0.1753	0.1612	0.2732	0.5496

GIRLS

Variable	Flexed Arm Hang	Pull-ups	Sit-ups	Sit & Reach	Standing Long Jump	Shuttle Run	50-Yard Dash	Mile Run/Walk
Pull-ups	0.4528							
Sit-ups	0.3592	0.3354						
Sit & Reach	0.1880	0.1658	0.1981					
Standing Long Jump	0.3158	0.3942	0.4237	0.3563				
Shuttle Run	0.2333	0.0976	0.2888	0.0631	0.3430			
50-Yard Dash	0.2693	0.2425	0.3319	0.2047	0.5237	0.4704		
Mile Run/Walk	0.3765	0.3917	0.3651	0.2785	0.3725	0.3780	0.4181	
Two Mile Walk	0.3239	0.2129	0.2684	0.1019	0.3115	0.1454	0.3736	0.6254

TABLE 1 (cont'd)
INTERCOPRELATIONS FOR 10 YEAR OLDS

BOYS

Variable	Flexed Arm Hang	Pull-ups	Sit-ups	Sit & Reach	Standing Long Jump	Shuttle Run	50-Yard Dash	Mile Run/ Walk
Pull-ups	0.5998							
Sit-ups	0.3996	0.4309						
Sit & Reach	0.1884	0.2585	0.1870					
Standing Long Jump	0.4525	0.4782	0.4607	0.2611				
Shuttle Run	0.2017	0.2161	0.2144	0.0499	0.4919			
50-Yard Dash	0.3871	0.3827	0.3468	0.2332	0.6127	0.4462		
Mile Run/Walk	0.3951	0.4270	0.3609	0.0202	0 3561	0.3226	0.5382	
Two Mile Walk	0.2477	0.0264	0.1926	0.0306	0.3029	0.1461	0 0641	0.5269

GIRLS

Variable	Flexed Arm Hang	Pull-ups	Sit-ups	Sit & Reach	Standing Long Jump	Shuttle Run	50-Yard Dash	Mile Run/ Walk
Pull-ups	0.2298							
Sit-ups	0.3789	0.2534						
Sit & Reach	0.2875	0.1136	0.2503					
Standing Long Jump	0.2627	0.3016	0.4679	0.2848				
Shuttle Run	0.1683	0.1451	0.2997	0.0682	0.4223			
50-Yard Dash	0.2411	0.2569	0.4137	0.1592	0.6120	0.4195		
Mile Run/Walk	0.2674	0.2880	0.3638	0.3361	0.3579	0.3141	0.4865	
Two Mile Walk	0.2868	0.1947	0 3356	0.1147	0.2343	0.1712	0.2935	0.4910

INTERCORRELATIONS FOR 11 YEAR OLDS

BOYS

Variable	Flexed Arm Hang	Pull-ups	Sit-ups	Sit & Reach	Standing Long Jump	Shuttle Run	50-Yard Dash	Mile Run/ Walk
Pull-ups	0.6352							
Sit-ups	0.3301	0.3017						
Sit & Reach	0.1341	0.0853	0.1464					
Standing Long Jump	0.4468	0.4874	0.4603	0.1455				
Shuttle Run	0.3439	0.3230	0.3661	0.0572	0.5900			
50-Yard Dash	0.3875	0 328	0.4085	0 0224	0.5838	0.4705		
Mile Run/Walk	0.3506	0.3662	0.2684	0 1440	0.4010	0.3958	0.5107	
Two Mile Walk	0.1829	0.0243	0.2187	0.0194	0 0986	0.0420	0.2378	0.3188

GIRLS

Variable	Flexed Arm Hang	Pull-ups	Sit-ups	Sit & Reach	Standing Long Jump	Shuttle Run	50-Yard Dash	Mile Run/ Walk
Pull-ups	0.2703							
Sit-ups	0.4401	0.3397						
Sit & Reach	0.2075	0.1289	0.2388					
Standing Long Jump	0 2445	0.2767	0 4478	0 1521				
Shuttle Run	0 0069	0.1782	0 3638	0.1381	0 4768			
50-Yard Dash	0.2008	0 2359	0.4890	0.3310	0.5086	0 4318		
Mile Run/Walk	0.2704	0 3031	0 4504	0 0972	0 3267	0 3400	0 3821	
Two Mile Walk	0 2407	0 1802	0 3398	0 1402	0 1676	0 0176	0 3550	0 5029

TABLE 1 (cont'd)
INTERCORRELATIONS FOR 12 YEAR OLDS

BOYS

Variable	Flexed Arm Hang	Pull-ups	Sit-ups	Sit & Reach	Standing Long Jump	Shuttle Run	50-Yard Dash	Mile Run/Walk
Pull-ups	0.6663							
Sit-ups	0.3163	0.2317						
Sit & Reach	0.1369	0.1209	0.1360					
Standing Long Jump	0.3266	0.4673	0 4027	0.1961				
Shuttle Run	0.2752	0.3923	0.3800	0.1130	0.5373			
50-Yard Dash	0.3003	0.4315	0.3398	0.1141	0.5468	0 5471		
Mile Run/Walk	0 4283	0.3717	0.3678	0.0081	0.3946	0.4525	0.4648	
Two Mile Walk	0.2268	0.2361	0.2192	0.0477	0.2568	0.2828	0.2024	0.4715

GIRLS

Variable	Flexed Arm Hang	Pull-ups	Sit-ups	Sit & Reach	Standing Long Jump	Shuttle Run	50-Yard Dash	Mile Run/Walk
Pull-ups	0.2944							
Sit-ups	0.3857	0.2094						
Sit & Reach	0.1219	0.0741	0.2163					
Standing Long Jump	0.3310	0.3131	0.4424	0.2374				
Shuttle Run	0.2074	0.1558	0.4589	0.0923	0.5139			
50-Yard Dash	0.1858	0.2239	0.4188	0.2053	0.5431	0.4324		
Mile Run/Walk	0.3242	0.3325	0 4442	0.0446	0.3637	0.3273	0.3795	
Two Mile Walk	0.1796	0.0708	0.2534	0.0424	0.1131	0.0405	0.1364	0.5508

INTERCORRELATIONS FOR 13 YEAR OLDS

BOYS

Variable	Flexed Arm Hang	Pull-ups	Sit-ups	Sit & Reach	Standing Long Jump	Shuttle Run	50-Yard Dash	Mile Run/Walk
Pull-ups	0.6593							
Sit-ups	0.2086	0.3154						
Sit & Reach	0.1712	0.3154	0.1817					
Standing Long Jump	0.3306	0 4327	0.3697	0.1966				
Shuttle Run	0.2230	0.3548	0.2571	0.0070	0.4688			
50-Yard Dash	0.3441	0.3832	0.2612	0.1240	0.5160	0 5042		
Mile Run/Walk	0.2184	0.3416	0.4254	0.1613	0.3100	0.3366	0 4603	
Two Mile Walk	0.0468	0.0443	0.2342	0.0336	0 0313	0.2414	0.1223	0 3886

GIRLS

Variable	Flexed Arm Hang	Pull-ups	Sit-ups	Sit & Reach	Standing Long Jump	Shuttle Run	50-Yard Dash	Mile Run/Walk
Pull-ups	0.4712							
Sit-ups	0.4670	0.0171						
Sit & Reach	0.2198	0.0193	0.3271					
Standing Long Jump	0 3675	0.4180	0.4644	0.3410				
Shuttle Run	0 2532	0 2260	0.3788	0.2455	0 6364			
50-Yard Dash	0.1796	0 2275	0 3594	0.1992	0.5947	0.4598		
Mile Run/Walk	0.4008	0.4087	0 5002	0.2590	0.4472	0 4241	0 3896	
Two Mile Walk	0 1884	0 0084	0 2543	0 1748	0 2736	0.1874	0 1307	0 3560

TABLE 1 (cont'd)
INTERCORRELATIONS FOR 14 YEAR OLDS

BOYS

Variable	Flexed Arm Hang	Pull-ups	Sit-ups	Sit & Reach	Standing Long Jump	Shuttle Run	50-Yard Dash	Mile Run/Walk
Pull-ups	0.6593							
Sit-ups	0.2495	0.2985						
Sit & Reach	0.0705	0.2511	0.1630					
Standing Long Jump	0.2599	0.5608	0.3804	0.2788				
Shuttle Run	0.3183	0.3391	0.2082	0.1269	0.4625			
50-Yard Dash	0.4105	0.4268	0.2444	0.1734	0.5722	0.3997		
Mile Run/Walk	0.2346	0.4575	0.4267	0.1526	0.4172	0.3702	0.4457	
Two Mile Walk	0.1741	0.0992	0.2388	0.1250	0..1665	0.1205	0.2784	0.5123

GIRLS

Variable	Flexed Arm Hang	Pull-ups	Sit-ups	Sit & Reach	Standing Long Jump	Shuttle Run	50-Yard Dash	Mile Run/Walk
Pull-ups	0.2471							
Sit-ups	0.3276	0.0736						
Sit & Reach	0.2206	0.0119	0.2219					
Standing Long Jump	0.2175	0.4820	0.4156	0.2275				
Shuttle Run	0.2436	0.1479	0.0681	0.1516	0.3864			
50-Yard Dash	0.2493	0.1722	0.3257	0.2906	0.3950	0.3920		
Mile Run/Walk	0.1843	0.3460	0.4009	0.2485	0.4299	0.3258	0.3472	
Two Mile Walk	0.3194	0.0599	0.2517	0.2174	0.2909	0.1531	0.2256	0.5523

INTERCORRELATIONS FOR 15 YEAR OLDS

BOYS

Variable	Flexed Arm Hang	Pull-ups	Sit-ups	Sit & Reach	Standing Long Jump	Shuttle Run	50-Yard Dash	Mile Run/Walk
Pull-ups	0.5056							
Sit-ups	0.3639	0.3133						
Sit & Reach	0.0409	0.2170	0.1726					
Standing Long Jump	0.2159	0.4536	0 2479	0.3111				
Shuttle Run	0.2743	0.2617	0.2873	0.2608	0.2493			
50-Yard Dash	0 4162	0.3698	0.2047	0.1272	0.5110	0.3127		
Mile Run/Walk	0.2027	0 3872	0.3753	0.0264	0.3807	0.1863	0.3099	
Two Mile Walk	0.0573	0 0602	0 2838	0.0021	0.1098	0 1243	0.1321	0.3284

GIRLS

Variable	Flexed Arm Hang	Pull-ups	Sit-ups	Sit & Reach	Standing Long Jump	Shuttle Run	50-Yard Dash	Mile Run/Walk
Pull-ups	0.2272							
Sit-ups	0.2779	0.1458						
Sit & Reach	0 2389	0 0071	0 2481					
Standing Long Jump	0 2442	0 3840	0 3642	0 2795				
Shuttle Run	0.1969	0 3039	0 2918	0.2043	0 4741			
50-Yard Dash	0 2557	0 3125	0.2954	0.2026	0.3592	0.5011		
Mile Run/Walk	0 2044	0 2856	0 4161	0.2459	0.4349	0.3547	0 2085	
Two Mile Walk	0 1901	0 1631	0 3192	0.1657	0.2585	0 2029	0 2090	0 4471

TABLE 1 (cont'd)
INTERCORRELATIONS FOR 16 YEAR OLDS

BOYS

Variable	Flexed Arm Hang	Pull-ups	Sit-ups	Sit & Reach	Standing Long Jump	Shuttle Run	50-Yard Dash	Mile Run/Walk
Pull-ups	0 4912							
Sit-ups	0 3825	0 4445						
Sit & Reach	0.0754	0.2422	0.2566					
Standing Long Jump	0.2519	0.3501	0.3169	0.3196				
Shuttle Run	0.2915	0 2894	0 3382	0.1637	0.3591			
50-Yard Dash	0.2845	0.3114	0.2333	0.0899	0 4267	0 3079		
Mile Run/Walk	0 2586	0.2788	0.3382	0 1744	0.4132	0.2585	0.4533	
Two Mile Walk	0.1494	0.2376	0.2029.	0 2095	0 1733	0 1767	0 1798	0 2553

GIRLS

Variable	Flexed Arm Hang	Pull-ups	Sit-ups	Sit & Reach	Standing Long Jump	Shuttle Run	50-Yard Dash	Mile Run/Walk
Pull-ups	0.3373							
Sit-ups	0.3206	0.1341						
Sit & Reach	0 1038	0.0792	0.2709					
Standing Long Jump	0.3719	0.1843	0.3326	0.1934				
Shuttle Run	0.3152	0.1866	0.3453	0.1964	0.5482			
50-Yard Dash	0.2801	0.2385	0.2433	0.1698	0.5040	0.5512		
Mile Run/Walk	0.3509	0.3557	0.4513	0.2639	0.4655	0.5430	0.2613	
Two Mile Walk	0.2178	0.1571	0.2711	0.1601	0.1982	0.2640	0.2505	0.4136

INTERCORRELATIONS FOR 17+ YEAR OLDS

BOYS

Variable	Flexed Arm Hang	Pull-ups	Sit-ups	Sit & Reach	Standing Long Jump	Shuttle Run	50-Yard Dash	Mile Run/Walk
Pull-ups	0 5642							
Sit-ups	0.3634	0 3677						
Sit & Reach	0.0718	0.1409	0.1121					
Standing Long Jump	0.2246	0.3316	0.1946	0 2171				
Shuttle Run	0.2190	0.2162	0.3451	0.1975	0.2616			
50-Yard Dash	0.3071	0.3505	0.3822	0.0218	0.5151	0.2874		
Mile Run/Walk	0 2706	0.2157	0.3769	0 0934	0.3540	0.1386	0.2282	
Two Mile Walk	0.1412	0 1310	0.2035	0 0229	0 1166	0.1311	0 3344	0 1976

GIRLS

Variable	Flexed Arm Hang	Pull-ups	Sit-ups	Sit & Reach	Standing Long Jump	Shuttle Run	50-Yard Dash	Mile Run/Walk
Pull-ups	0 0694							
Sit-ups	0 1899	0 1451						
Sit & Reach	0.0606	0.0811	0 2331					
Standing Long Jump	0 3640	0.2518	0 3359	0 2500				
Shuttle Run	0.2327	0 2079	0 2858	0 1140	0 4104			
50-Yard Dash	0.3977	0.1878	0.2590	0 0125	0 6420	0.4390		
Mile Run/Walk	0 2960	0.2450	0 2569	0 2595	0 3896	0 2295	0 3385	
Two Mile Walk	0 0911	0.2343	0 1589	0 0510	0 2690	0 1641	0 2061	0 1810

APPENDIX C

TABLE 1

SIMPLE RANDOM SAMPLE DESCRIPTIVE STATISTICS FOR BOYS AND GIRLS, AGES -6 -- 17+, 1985

BOYS -6

NAME	N	MEAN	STANDARD DEVIATION	RANGE MIN	RANGE MAX
MILE RUN-SECONDS	232	788.5733	176.5419	378 0	1325 0
LONG JUMP-INCHES	262	44.5916	8 7080	20 0	96 0
FLEX ARM HANG	242	7.8884	7.8104	0 0	55 0
PULL-UPS	241	1.2780	1 8712	0.0	11 0
50-YARD DASH	231	10.2195	1.2853	7 4	14 8
SHUTTLE RUN	225	13.4667	1 3866	11 0	19 5
2 MILE WALK-SECONDS	131	2038.0153	326.8668	1441.0	2977 0
SIT & REACH	213	0.6385	2.8210	-10 0	7 0
SIT-UPS	228	22.5570	9.7113	0.0	53 0

GIRLS -6

NAME	N	MEAN	STANDARD DEVIATION	RANGE MIN	RANGE MAX
MILE RUN-SECONDS	234	829.2137	162.3171	516.0	1300 0
LONG JUMP-INCHES	289	40.5917	6.7479	8.0	61 0
FLEX ARM HANG	278	7.0791	7.6720	0.0	55 0
PULL-UPS	245	0.7061	1.3257	0.0	8 0
50-YARD DASH	236	10.6763	1.4736	7 2	15 0
SHUTTLE RUN	248	13.8823	1.4076	9 1	19 8
2 MILE WALK-SECONDS	131	2114.2290	383.2747	1440.0	3120 0
SIT & REACH	197	2.4340	2.9771	-9.0	9.5
SIT-UPS	219	22.9041	8.7091	0.0	55 0

BOYS 7

NAME	N	MEAN	STANDARD DEVIATION	RANGE MIN	RANGE MAX
MILE RUN-SECONDS	397	726.9597	163 8510	460 0	1280 0
LONG JUMP-INCHES	441	47.3628	7 5064	24 0	67 0
FLEX ARM HANG	418	10.6220	10 0681	0 0	95 0
PULL-UPS	398	1 8090	2.2352	0.0	14 0
50-YARD DASH	397	9.8312	1 1107	7 0	13 9
SHUTTLE RUN	382	12.3613	1 5841	8 3	25 0
2 MILE WALK-SECONDS	278	2031 3058	359 7128	1440 0	3453 0
SIT & REACH	364	0.6909	' 7141	-9 0	9 0
SIT-UPS	385	27.1558	9 0520	1 0	56 0

GIRLS 7

NAME	N	MEAN	STANDARD DEVIATION	RANGE MIN	RANGE MAX
MILE RUN-SECONDS	347	789 7262	152 1252	484 0	1339 0
LONG JUMP-INCHES	405	43 3037	7 4713	22 0	70 0
FLEX ARM HANG	381	9 3097	10 0202	0 0	72 0
PULL-UPS	355	0 8056	1 5510	0 0	9 0
50-YARD DASH	370	10 1897	1 2489	7 0	17 0
SHUTTLE RUN	364	13.5170	1 6544	9 5	29 1
2 MILE WALK-SECONDS	275	2146 3455	361 1895	1448 0	3347 0
SIT & REACH	369	2.2317	2 8147	-9 0	9 0
SIT-UPS	403	25 3747	9 0840	0 0	55 0

TABLE 1

SIMPLE RANDOM SAMPLE DESCRIPTIVE STATISTICS FOR BOYS AND GIRLS, AGES -6 -- 17+, 1985

BOYS 8

NAME	N	MEAN	STANDARD DEVIATION	RANGE MIN	RANGE MAX
MILE RUN-SECONDS	417	684.7650	159.8297	390 [illegible]	1360 0
LONG JUMP-INCHES	477	51.8260	8 1174	25.0	90 0
FLEX ARM HANG	441	12.2880	10.7520	0 0	63 0
PULL-UPS	468	2 3376	2.7363	0.0	15 0
50-YARD DASH	470	9.2670	1.0967	7 0	13 8
SHUTTLE RUN	458	12.3926	1 4744	8.0	18 0
2 MILE WALK-SECONDS	336	1969.9345	339 4365	1453.0	3390 0
SIT & REACH	422	0.1754	2.7401	-10.0	7 0
SIT-UPS	447	30.4810	9.8474	0 0	58 0

GIRLS 8

NAME	N	MEAN	STANDARD DEVIATION	RANGE MIN	RANGE MAX
MILE RUN-SECONDS	403	763.2457	147.984[illegible]	480.0	1240.0
LONG JUMP-INCHES	465	47 4215	7.3855	25.0	81 0
FLEX ARM HANG	439	9.7130	9.5595	0.0	97 0
PULL-UPS	417	0.9976	1.8534	0.0	14 0
50-YARD DASH	435	9.6952	1.1823	6.8	15 8
SHUTTLE RUN	429	13.1471	1.5473	8.3	20 5
2 MILE WALK-SECONDS	317	2078.5205	343.9499	1440.0	3600 0
SIT & REACH	395	2.0646	2.6858	-6.0	12 0
SIT-UPS	411	28.6618	9.0922	0.0	59 0

BOYS 9

NAME	N	MEAN	STANDARD DEVIATION	RANGE MIN	RANGE MAX
MILE RUN-SECONDS	402	647.4104	140.3728	410 0	1180 0
LONG JUMP-INCHES	419	56.0119	7 8184	26 0	76 0
FLEX ARM HANG	406	13 1429	12 6894	0 0	101 0
PULL-UPS	413	2 6126	3.012[illegible]	0 0	21 0
50-YARD DASH	397	8 7861	0.8513	6 5	13 6
SHUTTLE RUN	407	12.1661	1 4220	8 1	[illegible]8 8
2 MILE WALK-SECONDS	318	1903.5943	294 3293	1446 0	3503 0
SIT & REACH	430	0.3895	3 0797	-13 0	13 0
SIT-UPS	451	31 9645	[illegible] 6850	1 0	60 0

GIRLS 9

NAME	N	MEAN	STANDARD DEVIATION	RANGE MIN	RANGE MAX
MILE RUN-SECONDS	377	732 5225	162 2206	371 0	[illegible]440 0
LONG JUMP-INCHES	408	50 1901	8 1301	25 0	73 0
FLEX ARM HANG	395	10 7089	11 2322	0 0	78 0
PULL-UPS	364	0 9890	1 7040	0 0	[illegible] 0
50-YARD DASH	377	9 1737	1 0736	6 4	15 0
SHUTTLE RUN	381	12.6155	1 6394	8 3	20 5
2 MILE WALK-SECONDS	291	1991 0481	309 6391	1440 0	2960 0
SIT & REACH	393	2 4211	3 3461	-11 0	14 0
SIT-UPS	409	30 0098	9 6116	0 0	62 0

TABLE 1

SIMPLE RANDOM SAMPLE DESCRIPTIVE STATISTICS FOR BOYS AND GIRLS, AGES -6 -- 17+, 1985

BOYS 10

NAME	N	MEAN	STANDARD DEVIATION	RANGE MIN	RANGE MAX
MILE RUN-SECONDS	375	620.1320	155.9303	384 0	1380 0
LONG JUMP-INCHES	416	59.1971	9 0856	33 0	104 0
FLEX ARM HANG	387	16.0076	15.9498	0 0	120 0
PULL-UPS	427	2.8033	3.0717	0 0	22 0
50-YARD DASH	416	8.5700	0.9757	6 0	14 8
SHUTTLE RUN	430	11.6588	1.4398	7 4	16 9
2 MILE WALK-SECONDS	301	1849.9269	325.7151	1440 0	3721 0
SIT & REACH	410	0.8690	3.6056	-12.0	14 5
SIT-UPS	445	35.1573	10.0026	4.0	64 0

GIRLS 10

NAME	N	MEAN	STANDARD DEVIATION	RANGE MIN	RANGE MAX
MILE RUN-SECONDS	366	697.4454	140.5133	386.0	1440 0
LONG JUMP-INCHES	424	54.2028	8.4756	29.0	84 0
FLEX ARM HANG	404	12.4827	16.1532	0.0	152 0
PULL-UPS	419	1.0334	1.6540	0.0	9 0
50-YARD DASH	439	8.9303	1.0018	6.7	13 7
SHUTTLE RUN	445	12.2171	1.4730	7.2	17 8
2 MILE WALK-SECONDS	322	1917.4814	338.1252	1444.0	3036 0
SIT & REACH	402	2.7400	3.4167	-17 0	13 0
SIT-UPS	428	30.2383	9.3656	0 0	61 0

BOYS 11

NAME	N	MEAN	STANDARD DEVIATION	RANGE MIN	RANGE MAX
MILE RUN-SECONDS	484	596.0620	154 0400	369 0	1412 0
LONG JUMP-INCHES	541	62.9741	9.3905	24.0	103 0
FLEX ARM HANG	481	16.2765	15 9579	0 0	101 0
PULL-UPS	594	2.8215	3 4906	0 0	25 0
50-YARD DASH	580	8.3436	0.9920	6 1	13 0
SHUTTLE RUN	596	11.2473	1 3299	7 0	16 8
2 MILE WALK-SECONDS	257	1800.8210	274 2976	1445 0	2875 0
SIT & REACH	348	0.9353	3 6781	-10 0	14 5
SIT-UPS	370	36.7784	9 6491	0 0	68 0

GIRLS 11

NAME	N	MEAN	STANDARD DEVIATION	RANGE MIN	RANGE MAX
MILE RUN-SECONDS	518	697 1641	149 5399	427 0	1252 0
LONG JUMP-INCHES	559	57 5188	8 6523	28 0	87 0
FLEX ARM HANG	556	10 8885	14 4849	0 0	150 0
PULL-UPS	516	1 1609	2 5019	0 0	24 0
50-YARD DASH	594	9 6170	1 0311	6 5	15 0
SHUTTLE RUN	605	11 7036	1 4342	7 1	20 6
2 MILE WALK-SECONDS	269	1927 9777	306 0198	1463 0	3115 0
SIT & REACH	304	3 3125	3 8537	-11 0	15 0
SIT-UPS	323	32 4056	9 7222	2 0	67 0

TABLE 1

SIMPLE RANDOM SAMPLE DESCRIPTIVE STATISTICS FOR BOYS AND GIRLS, AGES -6 -- 17+, 1985

BOYS 12

NAME	N	MEAN	STANDARD DEVIATION	RANGE MIN	RANGE MAX
MILE RUN-SECONDS	493	554.4909	133 9361	363 0	1385 0
LONG JUMP-INCHES	531	65.5141	9 5919	38 0	114 0
FLEX ARM HANG	490	15.7673	15 4191	0 0	111 0
PULL-UPS	577	3.1924	3.3191	0 0	21 0
50-YARD DASH	581	7 8478	0 8566	5 4	13 0
SHUTTLE RUN	579	10.7221	1 0220	7 5	16 1
2 MILE WALK-SECONDS	349	1729.3037	220.5361	1440.0	2522 0
SIT & REACH	467	0.4390	3 5950	-12 0	13 5
SIT-UPS	476	40.3256	9.8477	7.0	67 0

GIRLS 12

NAME	N	MEAN	STANDARD DEVIATION	RANGE MIN	RANGE MAX
MILE RUN-SECONDS	476	678.1912	162.0270	382.0	1494 0
LONG JUMP-INCHES	509	60.8310	9.3343	32.0	85 0
FLEX ARM HANG	505	10.9644	13.0832	0.0	99 0
PULL-UPS	484	0.9545	2.0567	0.0	22 0
50-YARD DASH	541	8.3678	1 0649	6.5	13 8
SHUTTLE RUN	545	11.4325	1.0786	7 7	16 1
2 MILE WALK-SECONDS	393	1825.3282	300.9385	1441 0	4045 0
SIT & REACH	430	3.6023	3.4764	-11 0	14 5
SIT-UPS	462	34.9307	9.4959	0.0	62 0

BOYS 13

NAME	N	MEAN	STANDARD DEVIATION	RANGE MIN	RANGE MAX
MILE RUN-SECONDS	553	521.9096	133.3466	340 0	1452 0
LONG JUMP-INCHES	585	70.9675	10 1750	30 0	117 0
FLEX ARM HANG	546	18.1374	19 2031	0 0	298 0
PULL-UPS	605	3.8215	3 7250	0 0	20 0
50-YARD DASH	608	7 5337	0 8527	5 6	12 9
SHUTTLE RUN	608	10 3683	0 9897	8 0	16 4
2 MILE WALK-SECONDS	457	1733.7133	225 4462	1440 0	2430 0
SIT & REACH	618	0.2039	3 4129	-12 5	11 0
SIT-UPS	636	42.4874	10.4679	0.0	76 0

GIRLS 13

NAME	N	MEAN	STANDARD DEVIATION	RANGE MIN	RANGE MAX
MILE RUN-SECONDS	590	658 0102	166 7926	342 0	1245 0
LONG JUMP-INCHES	620	62 5081	9 5543	32 0	88 0
FLEX ARM HANG	607	11 0447	11 3841	0 0	68 0
PULL-UPS	490	0.8224	2 0888	0 0	18 0
50-YARD DASH	614	8.0844	0 9790	6 4	15 8
SHUTTLE RUN	625	11 3090	1 2117	9 0	19 8
2 MILE WALK-SECONDS	541	1799 0721	261 3739	1442 0	4045 0
SIT & REACH	633	3 7978	3 5804	-11 0	12 5
SIT-UPS	649	36 3744	10 8631	0 0	72 0

APPENDIX C (cont'd)

TABLE 1

SIMPLE RANDOM SAMPLE DESCRIPTIVE STATISTICS
FOR BOYS AND GIRLS, AGES -6 -- 17+, 1985

BOYS 14

NAME	N	MEAN	STANDARD DEVIATION	RANGE MIN	MAX
MILE RUN-SECONDS	644	495.2360	124.4425	270.0	1090.0
LONG JUMP-INCHES	646	76.3282	11.1986	40.0	114.0
FLEX ARM HANG	630	27.7016	34.6956	0.0	415.0
PULL-UPS	725	5.2966	4.2879	0.0	23.0
50-YARD DASH	703	7.2360	0.9146	5.1	14.5
SHUTTLE RUN	723	10.1073	1.2862	6.6	19.9
2 MILE WALK-SECONDS	512	1720.6523	236.2291	1440.0	3023.0
SIT & REACH	704	.0829	3.5513	-12.0	12.0
SIT-UPS	814	43.3243	10.6362	0.0	79.0

GIRLS 14

NAME	N	MEAN	STANDARD DEVIATION	RANGE MIN	MAX
MILE RUN-SECONDS	628	633.7006	157.5001	300.0	1204.0
LONG JUMP-INCHES	667	63.7346	10.2042	19.0	112.0
FLEX ARM HANG	691	12.8365	13.9212	0.0	100.0
PULL-UPS	593	0.9427	2.5968	0.0	44.0
50-YARD DASH	756	8.0624	0.9116	6.3	12.9
SHUTTLE RUN	786	11.3996	1.5796	8.0	21.4
2 MILE WALK-SECONDS	586	1810.0529	220.2245	1440.0	2640.0
SIT & REACH	749	4.4219	3.4341	-10.0	14.0
SIT-UPS	780	37.3731	9.9008	0.0	72.0

BOYS 15

NAME	N	MEAN	STANDARD DEVIATION	RANGE MIN	MAX
MILE RUN-SECONDS	595	475.5613	118.1080	262.0	1304.0
LONG JUMP-INCHES	592	80.7095	10.4808	36.0	108.0
FLEX ARM HANG	561	33.4314	22.3879	0.0	130.0
PULL-UPS	643	6.4215	4.2986	0.0	29.0
50-YARD DASH	622	6.9540	0.7371	5.0	10.9
SHUTTLE RUN	642	9.8514	1.2462	6.3	19.8
2 MILE WALK-SECONDS	530	1733.6906	223.1222	1440.0	2668.0
SIT & REACH	753	1.7736	3.7279	-10.0	12.0
SIT-UPS	840	45.4679	10.7906	0.0	81.0

GIRLS 15

NAME	N	MEAN	STANDARD DEVIATION	RANGE MIN	MAX
MILE RUN-SECONDS	533	610.2439	157.7297	351.0	1447.0
LONG JUMP-INCHES	584	63.6404	9.9892	29.0	103.0
FLEX ARM HANG	602	13.3056	16.1605	0.0	125.0
PULL-UPS	542	0.7325	1.6496	0.0	14.0
50-YARD DASH	666	8.0437	0.9202	5.8	12.9
SHUTTLE RUN	695	11.1032	1.1753	8.3	16.6
2 MILE WALK-SECONDS	629	1825.8315	202.3121	1445.0	2640.0
SIT & REACH	735	4.7333	3.3745	-10.0	15.0
SIT-UPS	799	36.7647	10.6275	0.0	74.0

APPENDIX C (cont'd)

TABLE 1

SIMPLE RANDOM SAMPLE DESCRIPTIVE STATISTICS
FOR BOYS AND GIRLS, AGES -6 -- 17+, 1985

BOYS 16

NAME	N	MEAN	STANDARD DEVIATION	RANGE MIN	RANGE MAX
MILE RUN-SECONDS	517	465.4333	122.8726	289 0	1215 0
LONG JUMP-INCHES	530	83.7925	10.8256	42.0	121 0
FLEX ARM HANG	459	31.1220	21 9712	0 0	125 0
PULL-UPS	535	7.1813	4.3065	0 0	26 0
50-YARD DASH	498	6.7781	0 8026	5.0	14 0
SHUTTLE RUN	527	9.5531	1 2257	6 5	23 0
2 MILE WALK-SECONDS	452	1723.3872	210.5640	1440 0	2730 0
SIT & REACH	551	2.4764	3.6588	-12.0	13 0
SIT-UPS	639	44 7136	10.4575	6.0	77 0

GIRLS 16

NAME	N	MEAN	STANDARD DEVIATION	RANGE MIN	RANGE MAX
MILE RUN-SECONDS	366	671.7869	184 2498	358.0	1260 0
LONG JUMP-INCHES	415	63.8289	9.9747	38.0	98 0
FLEX ARM HANG	410	12.3756	14.7834	0.0	131 0
PULL-UPS	340	0.6765	1.4167	0.0	10 0
50-YARD DASH	419	8.1482	0.9450	6.0	12 4
SHUTTLE RUN	441	11.1029	1.1155	6.4	15 4
2 MILE WALK-SECONDS	402	1842.4478	197.7827	1440.0	2551 0
SIT & REACH	451	5.3625	3.3774	-6.0	15 0
SIT-UPS	518	35.4807	10.5053	0.0	77 0

BOYS 17+

NAME	N	MEAN	STANDARD DEVIATION	RANGE MIN	RANGE MAX
MILE RUN-SECONDS	461	446.6052	95.5282	286 0	1009 0
LONG JUMP-INCHES	482	87.1390	10.4968	52.0	118 0
FLEX ARM HANG	402	31.4726	18 7746	0.0	116 0
PULL-UPS	575	8.3443	4.7277	0.0	26 0
50-YARD DASH	548	6.7186	0.6612	5 1	14 6
SHUTTLE RUN	586	9.5710	1 1623	6.9	23 0
2 MILE WALK-SECONDS	449	1723.5746	205.3728	1440 0	2520 0
SIT & REACH	549	2 8470	3 8815	-10 0	12 5
SIT-UPS	597	44.0402	10.7015	1 0	73 0

GIRLS 17+

NAME	N	MEAN	STANDARD DEVIATION	RANGE MIN	RANGE MAX
MILE RUN-SECONDS	267	649 5431	159 5769	380 0	1730 0
LONG JUMP-INCHES	311	64 4051	10.5303	27.0	9[illegible] 0
FLEX ARM HANG	313	12 0927	14 0243	0 0	[illegible]27 0
PULL-UPS	276	0 8152	2.2447	0 0	3[illegible] 0
50-YARD DASH	344	8 2145	0.9549	6 1	13 6
SHUTTLE RUN	375	11.1360	1 3235	7.6	19 8
2 MILE WALK-SECONDS	294	1807 1361	184 1919	1443 0	2732 0
SIT & REACH	334	4 6347	3 6317	-12 0	15 0
SIT-UPS	395	34 0886	10 0299	0 0	67 0

APPENDIX D

Percentile Scores of Nine Tests by Age and Sex, 1985

APPENDIX D

TABLE 1. FLEXED-ARM HANG FOR BOYS, 1985-86

Percentile Scores Based on Age/Test Scores in Seconds

Percentile	Age 6-	7	8	9	10	11	12	13	14	15	16	17+	Percentile
100	55	95	63	101	120	101	111	127	117	130	125	116	100
95	23	60	34	40	48	52	47	48	68	79	71	64	95
90	16	23	28	28	38	37	36	37	61	62	61	56	90
85	14	20	23	24	31	31	30	33	47	58	51	49	85
80	12	17	18	20	25	26	25	29	40	49	46	45	80
75	10	15	17	18	22	22	21	25	35	44	42	41	75
70	9	13	15	16	20	19	19	22	31	40	39	39	70
65	9	11	14	14	17	17	[illegible]	20	28	37	36	37	65
60	8	10	12	12	15	15	1[illegible]	18	25	35	33	35	60
55	7	9	11	11	14	13	13	16	22	33	30	33	55
50	6	8	10	10	12	11	12	14	20	30	28	30	50
45	5	7	9	8	10	10	10	12	17	28	25	29	45
40	5	6	8	8	8	9	9	10	15	25	22	26	40
35	4	5	6	7	7	7	8	9	13	22	20	23	35
30	3	4	5	5	6	6	6	8	11	20	18	20	30
25	2	4	4	5	5	5	5	6	10	18	15	17	25
20	2	3	3	3	3	4	4	5	8	14	12	15	20
15	1	2	2	3	2	3	2	4	5	10	10	11	15
10	1	1	1	2	1	1	1	2	3	8	7	8	10
5	0	0	0	0	0	0	0	0	1	3	3	5	5
0	0	0	0	0	0	0	0	0	0	0	0	0	0

TABLE 1. FLEXED ARM HANG FOR GIRLS, 1985-86

Percentile Scores Based on Age/Test Scores in Seconds

Percentile	Age 6-	7	8	9	10	11	12	13	14	15	16	17+	Percentile
100	55	72	97	78	152	150	99	68	100	125	131	127	100
95	22	29	6	35	38	33	37	35	38	41	40	3[illegible]	95
90	15	21	21	23	29	25	27	28	31	34	30	29	90
85	13	17	17	20	22	20	21	21	25	28	24	24	85
80	11	14	15	16	19	16	16	19	21	23	21	20	80
75	10	12	13	14	16	14	14	16	18	18	18	18	75
70	9	11	11	12	14	13	13	14	16	15	16	15	70
65	8	9	10	11	12	11	11	12	13	12	13	12	65
60	6	8	10	10	11	9	10	10	11	10	10	11	60
55	6	7	9	9	9	8	8	9	10	9	9	10	55
50	5	6	8	8	8	7	7	8	9	7	7	7	50
45	5	5	7	7	7	6	6	6	7	6	6	6	45
40	4	5	6	6	6	5	5	5	6	5	5	5	40
35	3	5	5	5	5	4	4	5	5	4	4	5	35
30	3	4	4	4	4	4	3	4	4	4	3	4	30
25	2	3	3	3	3	3	2	3	3	3	3	2	25
20	1	2	3	2	2	2	1	1	2	2	2	2	20
15	1	1	1	1	1	1	1	1	1	1	1	1	15
10	0	0	0	0	0	0	0	0	0	1	0	1	10
5	0	0	0	0	0	0	0	0	0	0	0	0	5
0	0	0	0	0	0	0	0	0	0	0	0	0	0

TABLE 2. PULL-UP FOR BOYS, 1985-86

Percentile Scores Based on Age/Test Scores in Number of Pull-Ups

Percentile	Age 6-	7	8	9	10	11	12	13	14	15	16	17+	Percentile
100	11	14	15	21	22	25	21	20	23	29	26	26	100
95	5	6	8	8	9	10	10	11	13	14	15	17	95
90	3	5	6	6	7	7	8	9	11	12	12	15	90
85	2	4	5	5	6	6	7	7	10	11	11	13	85
80	1	4	4	5	5	5	6	7	9	10	10	12	80
75	1	3	4	4	4	4	5	6	8	10	10	11	75
70	1	2	3	4	4	4	5	5	7	9	9	10	70
65	0	2	3	3	3	3	4	5	6	8	8	10	65
60	0	2	2	3	3	3	3	4	6	7	8	10	60
55	0	1	2	2	2	2	3	4	5	7	7	9	55
50	0	1	1	2	2	2	2	3	5	6	7	8	50
45	0	1	1	1	2	1	2	2	4	5	7	7	45
40	0	1	1	1	1	1	1	2	4	5	6	7	40
35	0	0	0	1	1	1	1	1	3	4	5	6	35
30	0	0	0	0	1	0	1	1	3	4	5	5	30
25	0	0	0	0	0	0	0	1	2	3	4	5	25
20	0	0	0	0	0	0	0	0	1	2	4	4	20
15	0	0	0	0	0	0	0	0	1	2	3	3	15
10	0	0	0	0	0	0	0	0	0	1	2	2	10
5	0	0	0	0	0	0	0	0	0	0	0	1	5
0	0	0	0	0	0	0	0	0	0	0	0	0	0

TABLE 2. PULL-UP FOR GIRLS, 1985-86

Percentile Scores Based on Age/Test Scores in Number of Pull-Ups

Percentile	Age 6-	7	8	9	10	11	12	13	14	15	16	17+	Percentile
100	8	8	14	11	9	24	22	13	24	14	10	21	100
95	4	4	5	4	5	5	5	5	4	3	4	4	95
90	3	3	3	3	3	3	3	2	3	2	2	2	90
85	2	2	2	2	3	3	2	2	2	2	1	1	85
80	1	1	2	2	2	2	2	1	1	1	1	1	80
75	1	1	1	1	2	2	1	1	1	1	1	1	75
70	1	1	1	1	1	1	1	0	1	1	1	1	70
65	0	0	1	1	1	1	0	0	1	0	0	1	65
60	0	0	0	0	1	0	0	0	0	0	0	0	60
55	0	0	0	0	0	0	0	0	0	0	0	0	55
50	0	0	0	0	0	0	0	0	0	0	0	0	50
45	0	0	0	0	0	0	0	0	0	0	0	0	45
40	0	0	0	0	0	0	0	0	0	0	0	0	40
35	0	0	0	0	0	0	0	0	0	0	0	0	35
30	0	0	0	0	0	0	0	0	0	0	0	0	30
25	0	0	0	0	0	0	0	0	0	0	0	0	25
20	0	0	0	0	0	0	0	0	0	0	0	0	20
15	0	0	0	0	0	0	0	0	0	0	0	0	15
10	0	0	0	0	0	0	0	0	0	0	0	0	10
5	0	0	0	0	0	0	0	0	0	0	0	0	5
0	0	0	0	0	0	0	0	0	0	0	0	0	0

TABLE 3. SIT-UP FOR BOYS (FLEXED LEG), 1985-86

Percentile Scores Based on Age/Test Scores in No. of Sit-ups in 60 Seconds

Percentile	Age 6-	7	8	9	10	11	12	13	14	15	16	17+	Percentile
100	53	56	58	60	64	68	67	76	79	81	77	73	100
95	40	42	47	48	51	51	57	59	62	62	62	61	95
90	37	38	42	44	48	49	53	55	58	59	58	57	90
85	33	36	40	41	45	47	50	53	56	57	56	55	85
80	31	34	38	40	43	45	48	51	54	55	53	53	80
75	28	33	37	38	41	43	47	50	52	53	51	51	75
70	26	31	36	37	40	42	45	48	51	51	50	50	70
65	25	31	35	35	40	40	44	46	49	50	48	48	65
60	24	30	34	34	38	39	43	45	48	49	48	46	60
55	23	29	32	33	36	38	42	43	47	47	46	45	55
50	22	28	31	32	35	37	40	42	45	45	45	44	50
45	21	26	30	31	34	36	39	41	44	44	44	43	45
40	20	25	29	30	33	35	38	40	42	43	42	41	40
35	19	24	28	29	32	34	37	39	41	41	40	40	35
30	17	22	26	27	30	32	35	38	40	40	40	40	30
25	16	21	25	26	30	31	34	36	39	38	38	38	25
20	14	20	23	24	28	29	32	34	37	36	37	36	20
15	13	18	20	22	25	27	30	32	35	35	35	35	15
10	10	15	18	20	23	25	27	30	33	32	31	32	10
5	7	12	14	16	19	20	25	26	28	29	27	27	5
0	0	1	0	1	4	0	7	0	0	0	6	1	0

TABLE 3. SIT-UP FOR GIRLS (FLEXED LEG)

Percentile Scores Based on Age/Test Scores in No. of Sit-ups in 60 Seconds

Percentile	Age 6-	7	8	9	10	11	12	13	14	15	16	17+	Percentile
100	55	55	59	62	61	67	62	72	72	74	77	67	100
95	36	42	43	45	45	48	50	52	53	55	53	53	95
90	33	36	40	41	42	44	47	50	49	51	49	47	90
85	32	34	38	39	40	42	45	46	47	48	45	44	85
80	31	32	36	38	38	40	43	44	45	46	43	41	80
75	30	31	35	36	37	39	41	42	43	44	41	40	75
70	28	30	33	35	35	37	40	42	42	41	40	38	70
65	27	29	31	34	34	35	39	40	41	40	38	37	65
60	25	27	30	32	32	35	38	40	40	39	37	36	60
55	24	26	30	31	32	33	36	38	39	37	36	35	55
50	23	25	29	30	30	32	35	37	37	36	35	34	50
45	21	24	28	30	29	31	34	36	36	35	34	33	45
40	20	23	27	29	29	30	32	35	35	34	33	31	40
35	20	22	25	27	27	29	31	33	34	32	32	30	35
30	19	21	24	26	26	28	30	31	32	31	30	30	30
25	17	20	23	25	25	27	29	30	31	30	30	28	25
20	16	1	22	23	23	25	27	28	30	28	27	25	20
15	14	17	20	20	21	24	25	26	28	26	25	25	15
10	11	15	18	19	19	20	23	23	25	23	23	22	10
5	7	10	12	13	14	15	20	19	20	20	19	19	5
0	0	0	0	0	0	2	0	0	0	0	0	0	0

TABLE 4. SHUTTLE RUN FOR BOYS

Percentile Scores Based on Age/Test Scores in Seconds and Tenths

Percentile	Age 6-	7	8	9	10	11	12	13	14	15	16	17+	Percentile
100	11.0	8.3	8.0	8.1	7.4	7.0	7.5	8.0	6.6	6.3	6.5	6.9	100
95	11.7	10.8	10.4	10.4	9.8	9.5	9.4	9.0	8.8	8.5	8.4	8.5	95
90	12.0	11.2	10.9	10.6	10.0	9.9	9.6	9.3	9.0	8.8	8.6	8.6	90
85	12.1	11.5	11.1	10.9	10.3	10.0	9.8	9.5	9.1	9.0	8.7	8.7	85
80	12.3	11.7	11.2	11.0	10.5	10.2	9.9	9.6	9.3	9.1	8.9	8.9	80
75	12.4	12.0	11.4	11.1	10.7	10.4	10.0	9.8	9.4	9.2	8.9	8.9	75
70	12.5	12.2	11.5	11.3	10.8	10.5	10.1	9.9	9.5	9.3	9.0	9.0	70
65	12.8	12.4	11.8	11.5	11.0	10.6	10.3	10.0	9.6	9.4	9.1	9.1	65
60	13.0	12.5	11.9	11.6	11.2	10.8	10.4	10.1	9.7	9.5	9.2	9.2	60
55	13.1	12.7	12.0	11.8	11.3	11.0	10.5	10.1	9.8	9.5	9.3	9.3	55
50	13.3	12.8	12.2	11.9	11.5	11.1	10.6	10.2	9.9	9.7	9.4	9.4	50
45	13.5	13.0	12.3	12.0	11.6	11.2	10.7	10.3	10.0	9.8	9.5	9.5	45
40	13.7	13.2	12.5	12.2	11.8	11.4	10.8	10.4	10.1	9.9	9.6	9.6	40
35	13.8	13.3	12.7	12.5	12.0	11.5	11.0	10.6	10.2	10.0	9.7	9.6	35
30	14.0	13.5	13.0	12.8	12.2	11.7	11.1	10.7	10.3	10.1	9.8	9.8	30
25	14.3	13.8	13.3	13.0	12.4	12.0	11.2	10.8	10.5	10.2	10.0	9.9	25
20	14.5	14.0	13.6	13.3	12.7	12.2	11.4	11.0	10.7	10.4	10.1	10.1	20
15	14.8	14.5	13.8	13.6	13.1	12.6	11.6	11.1	11.0	10.7	10.3	10.3	15
10	15.2	14.9	14.2	14.1	13.6	13.0	12.0	11.4	11.3	11.0	10.6	10.6	10
5	16.0	15.4	15.0	14.5	14.5	13.5	12.4	12.0	12.0	11.8	11.1	11.1	5
0	19.5	25.0	18.0	18.8	16.9	16.8	16.1	16.4	19.9	19.8	23.0	23.0	0

TABLE 4. SHUTTLE RUN FOR GIRLS

Percentile Scores Based on Age/Test Scores in Seconds and Tenths

Percentile	Age 6-	7	8	9	10	11	12	13	14	15	16	17+	Percentile
100	9.1	9.5	8.3	8.3	7.2	7.1	7.7	9.0	8.0	8.3	6.4	7.6	100
95	12.0	11.5	11.2	10.4	10.1	10.0	10.0	9.8	9.6	9.5	9.6	9.5	95
90	12.2	11.9	11.5	10.8	10.6	10.3	10.2	10.0	9.9	9.8	10.0	9.9	90
85	12.4	12.1	11.8	11.1	10.8	10.5	10.4	10.2	10.1	10.0	10.1	10.0	85
80	12.7	12.3	12.0	11.3	11.1	10.6	10.5	10.4	10.3	10.1	10.2	10.2	80
75	13.0	12.5	12.1	11.5	11.3	10.8	10.7	10.5	10.5	10.3	10.4	10.3	75
70	13.0	12.6	12.2	11.7	11.4	11.0	10.8	10.6	10.6	10.4	10.5	10.4	70
65	13.3	12.8	12 4	11.9	11.6	11.1	10.9	10.8	10.8	10.5	10.6	10.6	65
60	13.4	13.0	12.6	12.1	11.8	11.2	11.0	10.9	10.9	10.7	10.7	10.7	60
55	13.6	13.1	12.8	12.2	11.9	11.4	11.2	11.0	11.0	10.8	10.8	10.9	55
50	13.8	13.2	12.9	12.5	12.1	11.5	11.3	11.1	11.2	11.0	10.9	11.0	50
45	14.0	13.5	13.0	12.7	12.2	11.7	11.4	11.2	11.3	11.1	11.0	11.1	45
40	14.1	13.6	13.3	12.9	12.4	11.9	11.5	11.4	11.4	11.2	11.2	11.2	40
35	14.5	13.9	13.5	13.0	12.6	12.1	11.7	11.5	11.6	11.4	11.4	11.3	35
30	14.7	14.0	13.7	13.2	12.8	12.2	11.9	11.6	11.7	11.5	11.5	11.5	30
25	14.8	14.3	13.9	13.4	13.1	12.5	12.1	11.8	11.9	11.7	11.7	11.7	25
20	15.0	14.5	14.3	13.7	13.3	12.8	12.3	12.0	12.1	11.9	11.9	11.9	20
15	15.3	14.9	14.8	14.0	13.7	13.0	12.5	12.4	12.5	12.2	12.2	12.1	15
10	15.5	15.4	15.2	14.6	14.2	13.4	12.9	12.8	12.9	12.6	12.6	12.7	10
5	16.1	16.4	16.2	15.6	15.0	14.0	13.4	13.4	14.0	13.2	13.2	13.2	5
0	19.8	29.1	20.5	20.5	17.8	20.6	16.1	19.8	21.4	16.6	15.4	19.8	0

TABLE 5. STANDING LONG JUMP FOR BOYS. 1985-86

Percentile Scores Based on Age/Test Scores in Feet and Inches

Percentile	Age 6-	7	8	9	10	11	12	13	14	15	16	17+	Percentile
100	8'00"	5' 7"	7' 6"	6' 4"	8' 8"	8' 7"	9' 6"	9' 9"	9' 6"	9' 0"	10' 1"	9'10"	100
95	4' 8"	4'11"	5' 4"	5' 9"	6' 2"	6' 5"	6' 8"	7' 3"	7'11"	8' 0"	8' 4"	8' 5"	95
90	4' 6"	4' 9"	5' 2"	5' 6"	5'10"	6' 2"	6' 4"	6'11"	7' 6"	7'10"	8' 0"	8' 4"	90
85	4' 4"	4' 7"	5' 0"	5' 4"	5' 9"	6' 0"	6' 3"	6' 9"	7' 4"	7' 8"	7'10"	8' 1"	85
80	4' 3"	4' 6"	4'10"	5' 2"	5' 7"	5'11"	6' 1"	6' 7"	7' 2"	7' 5"	7' 8"	8' 0"	80
75	4' 1"	4' 5"	4' 9"	5' 1"	5' 6"	5' 9"	6' 0"	6' 6"	7' 0"	7' 4"	7' 7"	7'10"	75
70	4' 0"	4' 4"	4' 8"	5' 0"	5' 4"	5' 8"	5'10"	6' 4"	6'10"	7' 3"	7' 6"	7' 9"	70
65	3'11"	4' 3"	4' 7"	4'11"	5' 3"	5' 7"	5' 9"	6' 3"	6' 9"	7'11"	7' 4"	7' 8"	65
60	3'10"	4' 2"	4' 6"	4'10"	5' 2"	5' 6"	5' 8"	6' 2"	6' 7"	7' 0"	7' 3"	7' 6"	60
55	3' 9"	4' 1"	4' 5"	4' 9"	5' 0"	5' 5"	5' 7"	6' 1"	6' 6"	6'11"	7' 2"	7' 5"	55
50	3' 8"	4' 0"	4' 4"	4' 7"	4'11"	5' 3"	5' 5"	6' 0"	6' 4"	6' 9"	7' 1"	7' 4"	50
45	3' 7"	3'11"	4' 3"	4' 6"	4'10"	5' 2"	5' 4"	5'10"	6' 3"	6' 8"	7' 0"	7' 3"	45
40	3' 6"	3'10"	4' 2"	4' 5"	4' 9"	5' 1"	5' 3"	5' 9"	6' 2"	6' 7"	6'10"	7' 1"	40
35	3' 5"	3' 9"	4' 1"	4' 4"	4' 8"	5' 0"	5' 2"	5' 8"	6' 0"	6' 5"	6' 9"	7' 0"	35
30	3' 4"	3' 7"	4' 0"	4' 3"	4' 6"	4'11"	5' 1"	5' 6"	5'11"	6' 4"	6' 7"	6'11"	30
25	3' 3"	3' 6"	3'11"	4' 2"	4' 5"	4' 9"	5' 0"	5' 4"	5' 9"	6' 1"	6' 6"	6'10"	25
20	3' 2"	3' 5"	3' 9"	4' 0"	4' 3"	4' 7"	4'10"	5' 2"	5' 7"	6' 0"	6' 3"	6' 8"	20
15	3' 1"	3' 3"	3' 8"	3'11"	4' 1"	4' 5	4' 8"	5' 1"	5' 5"	5'10"	6' 0"	6' 5"	15
10	2'11"	3' 1"	3' 6"	3' 8"	4' 0"	4' 2"	4' 6"	4'10"	5' 2"	5' 7"	5' 9"	6' 1"	10
5	2' 8"	2'10"	3' 3"	3' 7"	3' 9"	3'11"	4' 2"	4' 6"	4' 9"	5' 2"	5' 4"	5' 8"	5
0	1' 8"	2' 0"	2' 1"	2' 2"	2' 9"	2' 0"	3' 2"	2' 6"	3' 4"	3' 0"	3' 6"	4' 4"	0

TABLE 5. STANDING LONG JUMP FOR GIRLS, 1985-86

Percentile Scores Based on Age/Test Scores in Feet and Inches

Percentile	Age 6-	7	8	9	10	11	12	13	14	15	16	17+	Percentile
100	5'11"	5'10"	6' 9"	6' 1"	7' 0"	7' 3"	7' 1"	7' 4"	9' 4"	8' 7"	8' 2"	7' 7"	100
95	4' 3"	4' 8"	5' 0"	5' 5"	5' 8"	6' 0"	6' 4"	6' 6"	6' 8"	6' 7"	6' 8"	6' 9"	95
90	4' 1"	4' 6"	4' 8"	5' 1"	5' 5"	5' 9"	6' 1"	6' 2"	6' 3"	6' 4"	6' 4"	6' 5"	90
85	4' 0"	4' 3"	4' 7"	4'11"	5' 3"	5' 6"	5'10"	6' 0"	6' 2"	6' 2"	6' 2"	6' 2"	85
80	3'10"	4' 2"	4' 5"	4' 9"	5' 1"	5' 5"	5' 8"	5'11"	6' 0"	6' 0"	6' 0"	6' 1"	80
75	3' 9"	4' 0"	4' 4"	4' 7"	5' 0"	5' 4"	5' 7"	5' 9"	5'10"	5'11"	5'11"	6' 0"	75
70	3' 8"	3'11"	4' 3"	4' 6"	4'10"	5' 3"	5' 5"	5' 8"	5' 8"	5' 9"	5' 9"	5'11"	70
65	3' 7"	3'10"	4' 2"	4' 5"	4' 9"	5' 1"	5' 5"	5' 7"	5' 7"	5' 8"	5' 8"	5' 9"	65
60	3' 6"	3' 9"	4' 2"	4' 4"	4' 8"	5' 0"	5' 4"	5' 5"	5' 6"	5' 6"	5' 6"	5' 8"	60
55	3' 5"	3' 8"	4' 1"	4' 3"	4' 7"	4'11"	5' 3"	5' 4"	5' 5"	5' 4"	5' 6"	5' 6"	55
50	3' 4"	3' 7"	4' 0"	4' 2"	4' 6"	4' 9"	5' 1"	5' 3"	5' 3"	5' 3"	5' 4"	5' 5"	50
45	3' 3"	3' 6"	3'11"	4' 1"	4' 5"	4' 8"	5' 0"	5' 1"	5' 2"	5' 2"	5' 2"	5' 4"	45
40	3' 3"	3' 5"	3'10"	4' 0"	4' 4"	4' 7"	4'11"	5' 0"	5' 1"	5' 1"	5' 1"	5' 3"	40
35	3' 2"	3' 4"	3' 9"	3'10"	4' 3"	4' 6"	4'10"	4'11"	5' 0"	5' 0"	5' 0	5' 1"	35
30	3' 1"	3' 3"	3' 7"	3' 9"	4' 2"	4' 5"	4' 9"	4' 9"	4'11"	4"11"	4'11"	5' 0"	30
25	3' 0"	3' 2"	3' 6"	3' 8"	4' 1"	4' 4"	4' 7"	4' 8"	4' 9"	4' 9"	4'10"	4'10"	25
20	2'11"	3' 1"	3' 5"	3' 7"	3'11"	4' 2"	4' 5"	4' 6"	4' 8"	4' 7"	4' 8"	4' 8"	20
15	2'10"	3' 0"	3' 3"	3' 6"	3' 9"	4' 0"	4' 3"	4' 5"	4' 6"	4' 5"	4' 6"	4' 5"	15
10	2' 9"	2'11"	3' 2"	3' 4"	3' 8"	3'10"	4' 0"	4' 2"	4' 3"	4' 3"	4' 3"	4' 2"	10
5	2' 5"	2' 8"	3' 0"	3' 2"	3' 4"	3' 7"	3' 9"	3'11"	4' 0"	4' 0"	3'11"	4' 0"	5
0	0' 8"	1'10"	2' 1"	2' 1"	2' 5"	2' 4"	2' 8"	2' 8"	1 7"	2' 5"	3' 2"	2' 3"	0

TABLE 6. 50-YARD DASH FOR BOYS

Percentile Scores Based on Age/Test Scores in Seconds and Tenths

Percentile	Age 6-	7	8	9	10	11	12	13	14	15	16	17+	Percentile
100	7.4	7.0	7.0	6.5	6.0	6.1	5.4	5.6	5.1	5.0	5.0	5.1	100
95	8.1	8.0	7.8	7.6	7.3	7.1	6.7	6.4	6.1	6.1	5.9	6.0	95
90	8.5	8.5	8.0	7.9	7.5	7.3	6.9	6.6	6.3	6.2	6.0	6.0	90
85	9.0	8.8	8.2	8.0	7.7	7.4	7.0	6.8	6.5	6.3	6.2	6.1	85
80	9.2	9.0	8.4	8.1	7.8	7.5	7.1	6.9	6.6	6.4	6.3	6.2	80
75	9.4	9.1	8.5	8.2	8.0	7.6	7.3	7.0	6.7	6.5	6.3	6.3	75
70	9.5	9.3	8.6	8.3	8.1	7.8	7.3	7.1	6.8	6.5	6.4	6.4	70
65	9.6	9.4	8.8	8.4	8.2	7.9	7.5	7.1	6.9	6.6	6.5	6.4	65
60	9.8	9.5	8.9	8.5	8.3	8.0	7.5	7.2	7.0	6.7	6.6	6.5	60
55	10.0	9.6	9.0	8.6	8.3	8.1	7.7	7.3	7.0	6.8	6.6	6.6	55
50	10.1	9.8	9.1	8.7	8.4	8.1	7.8	7.4	7.1	6.9	6.7	6.6	50
45	10.3	9.9	9.2	8.8	8.5	8.3	7.8	7.5	7.2	6.9	6.7	6.7	45
40	10.5	10.0	9.4	8.9	8.7	8.4	8.0	7.6	7.3	7.0	6.8	6.8	40
35	10.8	10.0	9.5	9.0	8.8	8.5	8.0	7.7	7.4	7.1	6.8	6.9	35
30	10.9	10.1	9.8	9.1	8.9	8.7	8.2	7.9	7.5	7.1	6.9	6.9	30
25	11.0	10.3	10.0	9.2	9.0	8.9	8.3	8.0	7.6	7.2	7.0	7.0	25
20	11.3	10.7	10.1	9.4	9.2	9.0	8.4	8.1	7.8	7.4	7.1	7.1	20
15	11.5	11.0	10.3	9.6	9.5	9.2	8.7	8.3	7.9	7.5	7.3	7.3	15
10	11.8	11.3	10.6	9.9	9.8	9.5	8.9	8.5	8.2	7.7	7.5	7.5	10
5	12.5	12.0	11.1	10.4	10.2	10.1	9.4	9.0	8.8	8.2	8.1	7.8	5
0	14.8	13.9	13.8	13.6	14.8	13.0	13.0	12.9	14.5	13.9	14.0	14.6	0

TABLE 6. 50-YARD DASH FOR GIRLS

Percentile Scores Based on Age/Test Scores in Seconds and Tenths

Percentile	Age 6-	7	8	9	10	11	12	13	14	15	16	17+	Percentile
100	7.2	7.0	6.8	6.4	6.7	6.5	6.3	6.4	6.3	5.8	6.0	6.1	100
95	8.1	8.4	7.9	7.8	7.6	7.3	7.0	6.9	6.8	6.8	6.9	6.8	95
90	8.9	8.7	8.2	8.0	7.9	7.5	7.3	7.1	7.0	7.0	7.1	7.1	90
85	9.3	9.0	8.6	8.1	8.0	7.7	7.4	7.2	7.2	7.2	7.3	7.2	85
80	9.6	9.2	8.7	8.3	8.1	7.8	7.5	7.3	7.3	7.3	7.4	7.4	80
75	9.8	9.4	9.9	8.5	8.2	8.0	7.6	7.4	7.4	7.4	7.5	7.5	75
70	10.0	9.5	9.1	8.6	8.4	8.0	7.8	7.5	7.5	7.5	7.6	7.7	70
65	10.1	9.7	9.2	8.8	8.5	8.1	7.9	7.6	7.7	7.6	7.7	7.8	65
60	10.2	9.8	9.3	8.9	8.6	8.2	8.0	7.7	7.8	7.7	7.9	7.9	50
55	10.4	10.0	9.5	9.0	8.7	8.4	8.1	7.8	7.9	7.8	7.9	8.1	55
50	10.8	10.1	9.6	9.1	8.8	8.5	8.2	7.9	8.0	7.9	8.0	8.2	50
45	10.9	10.2	9.8	9.2	8.9	8.6	8.3	8.0	8.0	8.0	8.1	8.3	45
40	11.0	10.4	9.9	9.3	9.0	8.7	8.5	8.1	8.2	8.1	8.2	8.4	40
35	11.1	10.5	10.0	9.4	9.1	8.8	8.6	8.3	8.3	8.2	8.3	8.5	35
30	11.2	10.7	10.2	9.6	9.3	8.9	8.7	8.4	8.4	8.4	8.4	8.6	30
25	11.4	10.8	10.4	9.7	9.4	9.1	8.9	8.5	8.5	8.5	8.6	8.7	25
20	11.8	11.0	10.5	9.9	9.6	9.3	9.0	8.7	8.7	8.6	8.8	8.9	20
15	12.0	11.4	10.9	10.1	9.9	9.6	9.2	8.9	8.9	8.8	9.1	9.1	15
10	12.5	11.7	11.2	10.4	10.2	9.9	9.7	9.3	9.2	9.1	9.3	9.3	10
5	13.5	12.2	11.9	11.0	10.8	10.3	10.4	10.0	9.7	9.8	10.0	10.0	5
0	15.0	17.0	15.8	15.0	13.7	15.0	13.8	15.8	12.9	12.9	12.4	13.6	0

TABLE 7. 1-MILE RUN FOR BOYS

Percentile Scores Based on Age/Test Scores in Minutes and Seconds

Percentile	Age 6-	7	8	9	10	11	12	13	14	15	16	17	Percentile
100	6'18"	7'41"	6'30"	6'50"	6'24"	6'29"	6'03"	5'40"	4'30"	4'42"	4'49"	4'46"	100
95	8'54"	8'31"	8'00"	7'48"	7'10"	6'56"	6'43"	6'25"	6'01"	5'50"	5'40"	5'35"	95
90	9'41"	5'56"	8'28"	8'14"	7'39"	7'17"	6'57"	6'39"	6'13"	6'07"	5'56"	5'57"	90
85	10'15"	9'22"	8'48"	8'31"	7'57"	7'32"	7'11"	6'50"	6'26"	6'20"	6'08"	6'06"	85
80	10'32"	9'43"	9'00"	8'47"	8'08"	7'45"	7'25"	7'00"	6'33"	6'29"	6'18"	6'14"	80
75	10'53"	10'02"	9'23"	9'04"	8'19"	8'00"	7'41"	7'11"	6'45"	6'38"	6'25"	6'23"	75
70	11'17"	10'20"	9'38"	9'12"	8'37"	8'14"	7'56"	7'20"	6'59"	6'48"	6'33"	6'32"	70
65	11'41"	10'34"	9'56"	9'30"	8'59"	8'27"	8'05"	7'29"	7'09"	6'57"	6'44"	6'40"	65
60	12'00"	10'55"	10'15"	9'47"	9'11"	8'45"	8'14"	7'41"	7'19"	7'06"	6'50"	6'50"	60
55	12'20"	11'19"	10'39"	10'07"	9'29"	9'01"	8'25"	7'55"	7'29"	7'16"	6'58"	6'57"	55
50	12'36"	11'40"	11'05"	10'30"	9'48"	9'20"	8'40"	8'06"	7'44"	7'30"	7'10"	7'04"	50
45	13'00"	11'56"	11'27"	10'46"	10'10"	9'46"	8'58"	8'17"	7'59"	7'39"	7'20"	7'14"	45
40	13'39"	12'17"	11'55"	11'03"	10'32"	10'07"	9'11"	8'35"	8'13"	7'52"	7'35"	7'24"	40
35	14'11"	12'50"	12'08"	11'20"	10'58"	10'25"	9'40"	8'54"	8'30"	8'08"	7'53"	7'35"	35
30	14'48"	13'23"	12'30"	11'44"	11'14"	10'54"	10'00"	9'10"	8'48"	8'29"	8'09"	7'52"	30
25	15'12"	13'49"	12'54"	12'08"	11'40"	11'25"	10'22"	9'35"	9'10"	8'40"	8'37"	8'06"	25
20	15'34"	14'16"	13'23"	12'33"	12'15"	12'00"	10'52"	10'02"	9'35"	9'05"	8'56"	8'25"	20
15	16'30"	15'00"	14'10"	12'59"	13'07"	12'29"	11'30"	10'39"	10'18"	9'34"	9'22"	8'56"	15
10	17'25"	16'12"	14'57"	13'52"	13'50"	13'08"	12'11"	11'43"	11'22"	10'10"	10'17"	9'23"	10
5	18'12"	17'43"	16'09"	15'01"	14'47"	14'35"	13'14"	12'47"	12'11"	11'25"	11'49"	10'15"	5
0	22'05"	21'20"	22'40"	19'40"	23'00"	23'32"	23'05"	24'12"	18'10"	21'44"	20'15"	16'49"	0

TABLE 7. 1-MILE RUN FOR GIRLS

Percentile Scores Based on Age/Test Scores in Minutes and Seconds

Percentile	Age 6-	7	8	9	10	11	12	13	14	15	16	17+	Percentile
100	8'36"	8'04"	8'00"	6'11"	6'26"	7'07"	6'22"	5'42"	5'00"	5'51"	5'58"	6'20"	100
95	10'06"	9'30"	9'10"	8'21"	8'07"	8'06"	7'35"	7'21"	7'20"	7'25"	7'26"	7'22"	95
90	10'29"	10'05"	9'45"	9'07"	8'49"	8'40"	8'00"	7'49"	7'43"	7'52"	7'55"	7'58"	90
85	11'20"	10'36"	10'02"	9'30"	9'19"	9'02"	8'23"	8'13"	7'59"	8'08"	8'23"	8'15"	85
80	11'37"	10'55"	10'20"	10'03"	9'38"	9'22"	8'52"	8'29"	8'20"	8'24"	8'39"	8'34"	80
75	12'00"	11'17"	10'53"	10'22"	10'08"	9'44"	9'15"	8'49"	8'36"	8'40"	8'50"	8'52"	75
70	12'12"	11'25"	11'20"	10'45"	10'19"	10'04"	9'36"	9'09"	8'50"	8'55"	9'11"	9'15"	70
65	12'20"	11'45"	11'38"	10'58"	10'42"	10'24"	10'05"	9'30"	9'09"	9'09"	9'25"	9'33"	65
60	12'31"	12'20"	11'53"	11'13"	10'52"	10'42"	10'26"	9'50"	9'27"	9'23"	9'48"	9'51"	60
55	12'45"	12'39"	12'10"	11'32"	11'00"	11'00"	10'44"	10'07"	9'51"	9'37"	10'09"	10'08"	55
50	13'12"	12'56"	12'30"	11'52"	11'22"	11'17"	11'05"	10'23"	10'06"	9'58"	10'31"	10'22"	50
45	13'56"	13'21"	12'46"	12'13"	11'40"	11'36"	11'23"	10'57"	10'25"	10'18"	10'58"	10'48"	45
40	14'14"	13'44"	13'07"	12'24"	11'58"	12'00"	11'47"	11'20"	10'51"	10'40"	11'15"	11'05"	40
35	14'45"	14'04"	13'31"	12'48"	12'08"	12'21"	12'01"	11'40"	11'10"	11'00"	11'44"	11'20"	35
30	15'09"	14'32"	13'56"	13'19"	12'30"	12'42"	12'24"	12'00"	11'36"	11'20"	12'08"	12'00"	30
25	15'27"	14'55"	14'21"	13'44"	13'00"	13'09"	12'46"	12'29"	11'52"	11'48"	12'42"	12'11"	25
20	16'10"	15'12"	14'53"	14'07"	13'29"	13'44"	13'35"	13'01"	12'13"	12'19"	13'23"	12'40"	20
15	16'45"	16'00"	15'19"	14'57"	14'00"	14'16"	14'12"	14'10"	12'56"	13'33"	14'16"	13'23"	15
10	17'36"	16'35"	15'45"	15'40"	14'30"	14'44"	14'39"	14'49"	14'10"	14'13"	16'03"	14'01"	10
5	19'00"	17'27"	16'55"	16'58"	15'43"	16'07"	16'00"	16'10"	15'44"	15'17"	18'00"	15'14"	5
0	21'40"	22'19"	20'40"	24'00"	24'00"	21'02"	24'54"	20'45"	20'04"	24'07"	21'00"	28'50"	0

TABLE 8. 2-MILE WALK/BOYS, 1985-86

Percentile Scores Based on Age/Test Scores in Minutes and Seconds

Percentile	Age 6-	7	8	9	10	11	12	13	14	15	16	17+	Percentile
100	24'01"	24'00"	24'13"	24'06"	24'00"	24'05"	24'00"	24'00"	24'00"	24'00"	24'00"	24'00"	100
95	25'59"	25'43"	25'19"	25'06"	24'36"	24'30"	24'30"	24'14"	24'10"	24'24"	24'20"	24'32"	95
90	27'23"	27'24"	26'12"	25'55"	25'12"	24'57"	24'55"	24'40"	24'30"	24'45"	24'50"	24'57"	90
85	28'05"	28'18"	27'20"	26'44"	25'42"	25'25"	25'07"	25'01"	24'50"	25'08"	25'16"	25'20"	85
80	28'49"	28'50"	28'01"	27'37"	26'25"	25'50"	25'29"	25'30"	25'06"	25'30"	25'34"	25'37"	80
75	29'20"	29'25"	28'43"	28'07"	27'00"	26'37"	25'58"	26'07"	25'20"	25'50"	25'48"	26'00"	75
70	30'28"	30'16"	29'23"	28'38"	27'30"	27'00"	26'18"	26'24"	25'40"	26'29"	26'13"	26'30"	70
65	31'21"	30'46"	30'00"	28'59"	28'00"	27'30"	26'43"	'55"	26'16"	27'00"	26'35"	26'53"	65
60	31'48"	31'20"	30'29"	29'27"	28'35"	27'44"	27'04'	2, 18"	26'44"	27'15"	27'10"	27'16"	60
55	33'01"	31'57"	31'27"	30'39"	29'03"	28'06"	27'31"	27'48"	27'25"	27'34"	27'30"	27'40"	55
50	34'07"	32'40"	32'10"	31'14"	29'56"	28'52"	28'03"	28'14"	28'02"	27'57"	27'55"	28'06"	50
45	34'36"	33'36	32'50"	31'45"	30'34"	29'41"	28'31"	28'29"	28'21"	28'27"	28'10"	28'33"	45
40	35'15"	34'40"	33'26"	32'30"	31'29"	30'25"	28'51"	29'00"	28'57"	29'08"	28'59"	29'15"	40
35	35'44"	35'36"	34'22"	33'02"	32'03"	31'31"	29'05"	29'13"	29'27"	29'53"	29'44"	29'34"	35
30	36'35"	36'20"	35'00"	33'45"	32'43"	32'25"	30'00"	30'01"	30'10"	30'22"	30'30"	29'55"	30
25	37'08"	37'04"	35'44"	34'24"	33'26"	32'59"	31'01"	30'50"	30'54"	31'10"	31'00"	30'30"	25
20	38'50"	38'16"	37'13"	35'31"	34'20"	33'26"	31'48"	31'40"	31'53"	31'43"	31'48"	31'07"	20
15	40'20"	40'00"	38'37"	36'57"	35'29"	35'00"	33'10"	33'18"	32'44"	32'40"	32'40"	32'13"	15
10	41'10"	40'48"	39'56"	38'19"	37'30"	36'06"	34'14"	34'34"	34'30"	34'23"	33'47"	33'32"	10
5	43'35"	44'45"	41'55"	40'45"	38'53"	38'16"	36'00"	36'34"	36'02"	35'59"	35'15"	35'10"	5
0	49'37"	57'33"	56'30"	58'23"	62'01"	47'55"	42'02"	40'30"	50'23"	44'18"	45'30"	42'00"	0

TABLE 8. 2-MILE WALK FOR GIRLS, 1985-86

Percentile Scores Based on Age/Test Scores in Minutes and Seconds

Percentile	Age 6-	7	8	9	10	11	12	13	14	15	16	17+	Percentile
100	24'00"	24'08"	24'00"	24'00"	24'04"	24'23"	24'01"	24'02"	24'00"	24'05"	24'00"	24'03"	100
95	25'30"	26'53"	26'20"	25'56"	25'00"	25'30"	25'09"	24'49"	25'17"	25'30"	25'43"	25'20"	95
90	27'11"	28'20"	27'37"	27'06"	26'20"	26'35"	25'46"	25'54"	25'53"	26'30"	26'27"	26'30"	90
85	28'09"	29'57"	29'19"	28'04"	26'46"	27'11"	26'20"	26'24"	26'32"	27'09"	27'20"	26'59"	85
80	28'54"	30'46"	30'09"	28'53"	27'02"	27'43"	26'55"	27'00"	26 53"	27'46"	28'06"	27'24"	80
75	31'00"	31'36"	30'46"	29'09"	27'35"	28'23"	27'17"	27'11"	27'23"	28'09"	28'36"	27'58"	75
70	31'30"	32'30"	31'19"	29'56"	28'03"	28'50"	27'33"	27'39"	27'54"	28'30"	29'11"	28'22"	70
65	32'30"	33'13"	32'00"	30'35"	28'30"	29'34"	28'03"	28'08"	28'17"	28'49"	29'30"	28'48"	65
60	32'50"	33'41"	32'35"	31'15"	29'10"	30'06"	28'28"	28'27"	28'39"	29'10"	29'50"	29'17"	60
55	33'50"	34'10"	33'07"	31'45"	29'49"	30'37"	28'48"	28'47"	29'07"	29'42"	30'10"	29'40"	55
50	35'16"	35'10"	33'51"	32'45"	30'28"	31'15"	29'15"	29'01"	29'34"	30'06"	30'30"	30'10"	50
45	36'00"	35'52"	34'52"	33'30"	31'35"	31'35"	29'50"	29'30"	30'01"	30'30"	30'50"	30'20"	45
40	36'20"	36'15"	35'40"	33'57"	32'25"	32'35"	30'02"	29'58"	30'33"	30'50"	31'00"	30'49"	40
35	37'42"	37'09"	36'20"	34'36"	33'02"	32'55"	30'41"	30'32"	31'00"	31'10"	31'33"	31'03"	35
30	38'53"	38'19"	37'07"	35'06"	34'04"	34'00"	31'25"	30'57"	31'46"	31'40"	31'53"	31'37"	30
25	39'42"	40'18"	37'40"	35'36"	35'00"	34'55"	32'45"	31'47"	32'26"	32'17"	32'26"	32'01"	25
20	40'25"	41'20"	39'00"	37'05"	36'18"	36'00"	33'49"	32'40"	33'12"	33'00"	33'04"	32'24"	20
15	40'21"	42'00"	40'02"	39'00"	37'47"	37'24"	34'23'	33'56"	34'07"	33'38"	34'05"	32'40"	15
10	42'42"	43'00"	41'28"	40'38"	39'50"	39'00"	35'50"	34'55"	35 15"	34'45"	34'45"	33'42"	10
5	48'12"	46'30"	43'26"	42'36"	43'00"	42'50"	38'50"	37'00"	36'50"	36'36"	36'[illegible]"	34'50"	5
0	52'00"	55'47"	60'00"	49'20"	50'36"	51'55"	67'25"	67'25"	44'00"	44'00"	42'31"	45'32"	0

TABLE 9. SIT & REACH FOR BOYS

Percentile Scores Based on Age/Scores in Inches

Percentile	Age 6-	7	8	9	10	11	12	13	14	15	16	17+	Percentile
100	7.0	9.0	7.0	13.0	14.5	14.5	13.5	11.0	12.0	12.0	13.0	12.[illegible]	100
95	5.0	5.0	4.0	5.0	7.0	6.5	5.5	5.0	6.5	7.0	8.0	8.[illegible]	95
90	4.0	4.0	3.5	4.0	5.0	5.0	5.0	4.0	5.0	6.0	7.0	8.0	90
85	3.5	3.5	3.0	3.0	4.0	4.0	4.0	3.5	4.5	5.0	6.0	7.0	85
80	3.0	3.0	2.5	3.0	3.0	4.0	3.0	3.0	4.0	5.0	5.5	6.0	80
75	2.0	2.0	2.0	2.0	3.0	3.0	3.0	2.5	3.5	4.0	5.0	5.5	75
70	2.0	2.0	2.0	2.0	2.0	2.5	2.0	2.0	3.0	4.0	4.5	5.0	70
65	1.5	2.0	1.0	1.5	2.0	2.0	2.0	1.5	2.5	3.0	4.0	4.5	65
60	1.0	1.5	1.0	1.0	1.5	2.0	1.5	1.0	2.0	3.0	3.5	4.0	60
55	1.0	1.0	1	1.0	1.0	1.0	1.0	1.0	2.0	2.5	3.0	3.5	55
50	1.0	1.0	0.	1.0	1.0	1.0	1.0	0.5	1.0	2.0	3.0	3.0	50
45	0.5	0.5	0	0.0	0.5	1.0	0.0	0.0	1.0	2.0	2.0	3.0	45
40	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	1.0	2.0	2.0	40
35	0.0	0.0	-1.0	-0.5	0.0	0.0	-0.5	-1.0	0.0	1.0	1.5	1.5	35
30	0.0	-0.5	-1.0	-1.0	0.0	-1.0	-1.0	-1.0	0.0	0.0	1.0	1.0	30
25	[illegible]	-1.0	-1.5	-1.5	-1.0	-1.0	-2.0	-2.0	-1.0	0.0	0.5	1.0	25
20	[illegible]	-1.0	-2.0	-2.0	-2.0	-2.0	-2.0	-2.5	-2.0	-1.0	0.0	0.0	20
15	-2.0	-2.0	-3.0	-2.5	-2.5	-3.0	-3.0	-3.0	-2.0	-2.0	-1.0	-1.0	15
10	-3.0	-3.0	-3.0	-3.0	-3.5	-3.5	-4.5	-4.0	-4.0	-3.0	-3.0	-2.0	10
5	-4.5	-4.0	-4.0	-5.0	-5.0	-5.0	-6.0	-6.0	-5.0	-5.0	-4.0	-4.0	5
0	-10.0	-9.0	-10.0	-13.	-12.0	-10.0	-12.0	-12.5	-12.0	-10.0	-12.0	-10.0	0

TABLE 9. SIT & REACH FOR GIRLS

Percentile Scores Based on Age/Test Scores in Inches

Percentile	Age 6-	7	8	9	10	11	12	13	14	15	16	17+	Percentile
100	9.5	9.0	12.0	14.0	13.0	15.0	14.5	14.5	14.0	15.0	15.0	15.0	100
95	7.0	6.5	6.0	8.0	8.0	10.0	9.0	9.0	10.0	10.0	10.5	10.5	95
90	6.0	5.5	5.0	6.0	7.0	8.0	8.0	8.0	8.5	9.0	9.5	9.0	90
85	5.5	5.0	4.5	5.5	6.0	6.5	7.0	7.0	8.0	8.[illegible]	9.0	8.0	85
80	5.0	4.5	4.0	5.0	5.0	6.0	6.0	6.0	7.0	7.5	8.0	7.5	80
75	5.0	4.0	4.0	4.0	5.0	5.0	6.0	6.0	6.5	7.0	8.0	7.0	75
70	4.0	4.0	3.5	4.0	4.0	5.0	5.0	5.0	6.0	6.5	7.0	6.0	70
65	3.5	3.0	3.0	3.5	4.0	4.5	5.0	5.0	6.0	6.0	7.0	6.0	65
60	3.0	3.0	3.0	3.0	3.0	4.0	4.5	4.5	5.0	6.0	6.0	5.5	60
55	3.0	3.0	2.5	3.0	3.0	4.0	4.0	4.	5.0	5.0	6.0	5.0	55
50	2.5	2.0	2.0	2.0	3.0	3.0	3.5	3.5	4.5	5.0	5.5	4.5	50
45	2.0	2.0	2.0	2.0	2.5	3.0	3.0	3.0	4.0	4.5	5.0	4.0	45
40	1.5	2.0	1.5	2.0	2.0	2.5	3.0	3.0	4.0	4.0	4.5	4.0	40
35	1.0	1.5	1.0	1.0	2.0	2.0	2.5	2.5	3.5	3.5	4.0	3.5	35
30	1.0	1.0	1.0	1.0	1.0	1.5	2.0	2.0	3.0	3.0	4.0	3.0	30
25	1.0	1.0	0.5	0.0	1.0	1.0	2.0	2.0	2.5	2.0	3.0	2.5	25
20	0.0	0.0	0.0	0.0	0.5	1.0	1.0	1.0	2.0	2.0	2.5	2.0	20
15	0.0	0.0	0.0	-0.5	0.0	0.0	0.5	0.5	1.0	1.0	2.0	1.5	15
10	-1.0	-1.0	-1.0	-1.0	-1.0	-0.5	0.0	0.0	0.0	0.5	1.0	1.0	10
5	-2.5	-3.0	-2.5	-3.0	-2.5	-3.0	-2.5	-2.5	-1.5	-1.0	-0.5	-1.0	5
0	-9.0	-9.0	-6.0	-11.0	-17.0	-11.0	-11.0	-11.0	-10.0	-10.0	-6.0	-12.0	0

APPENDIX E

Exhibits of Correspondence and Orientation Materials for Teachers

NATIONAL PHYSICAL FITNESS STUDY YOUTH FITNESS PROJECT
Division of Physical Education
CCP
The University of Michigan
Ann Arbor, Michigan 48109

18 January 1985

Guy Reiff, Ph.D.
Director
University of Michigan
(313) 764-4472

W.R. Dixon, Ph.D.
Associate Director
University of Michigan

Christine Spain
Project Officer
President's Council on
Physical Fitness and Sports

Ashley Hayes, Ed.D.
Acting Executive Director
President's Council on
Physical Fitness and Sports

The Late
Paul A. Hunsicker, Ph.D.
University of Michigan
Study Director 1958, 65, 75

Diane Jacoby
Administrative Assistant
University of Michigan

George Allen
Chairman
President's Council on
Physical Fitness and Sports

Name, Super.
Or present Superintendent
School District
Address
City, State, Zip

Dear Mr. ----------:

The President's Council on Physical Fitness and Sports is funding a nationwide survey designed to determine the status of selected aspects of the physical fitness of boys and girls, grades one through 12, in the public schools. The American Alliance for Health, Physical Education and Recreation, the President's Council on Physical Fitness and Sports, the National Fitness Foundation and the Society of State Directors of Health, Physical Education and Recreation all have endorsed this project. The University of Michigan has again been commissioned to conduct this research.

The first national survey of the physical fitness of school children in the United States was completed in 1958, the second in 1965 and a third in 1975. The Project Directors completed each of these studies. These data have been used for comparative purposes by numerous domestic and foreign researchers (British, Australian, Danish, Japanese, Canadian, Latin American). The norms have also been extensively utilized by The President's Council on Physical Fitness and Sports. The tests have received wide circulation through advertisements in magazines such as Time and Newsweek (i.e., "Can You Make the President's Team?" Since 1958 over 50,000,000 school children in the United States alone have taken these tests. While these data were based on a sample of youngsters representative of the public school population at those times, there are serious questions as to the appropriateness of the norms for today's youth. New norms need to be established by the 1985-86 school year.

In order to obtain an accurate cross section of boys and girls a scientifically selected national sample was designed and selected by the Survey Research Center of The University of Michigan.

The first step was to randomly select school districts. Your district was one selected into our sample. The design now calls for randomly choosing several schools within each district, and two or three classrooms per school. As in the previous surveys, where physical education is a required subject we intend to sample physical education classes. If physical education is not required we intend to sample homerooms (because the study population is all youngsters enrolled in the public schools, not just those in physical education).

The items selected for the survey include nine physical performance tests involving running, jumping, flexibility and muscular endurance. Three periods should more than suffice to complete these tests. The entire battery will be administered by your trained tester with the aid of local physical education teachers. Where feasible the plan is to invite your supervisory personnel in Physical Education to a regional clinic where test procedures will be demonstrated and standardized. We hope that you also will be able to attend. We will assume the costs of all testing plus expenses at clinics. A more detailed explanation is presented in the enclosed "Rationale".

Enclosed are packets for each school principal which contain an introductory letter, a form for listing classrooms and a Rationale. Since we presently do not have addresses for each school we are asking your office to distribute them. Please let me know of any postage charges, we will be happy to reimburse you!

As in the past three surveys, all test results will be held completely confidential. We are interested only in the nationwide conclusions. If requested, we will be happy to furnish you with the test results for your schools. With your permission, we would like to include your name and the schools', plus other personnel involved in the 1985-86 AAHPED Fitness Manual.

Now we need your cooperation and permission to administer the tests. We are hoping that we will receive (as in 1965 and 1975) 100% permission from our selected school districts. If you have any further questions do not hesitate to telephone me collect. We deeply appreciate your cooperation in this important project and look forward to hearing from you soon.

PLEASE CALL ME COLLECT (313)764-4472, TO LET ME KNOW ABOUT YOUR PARTICIPATION. THANK YOU!!

Positively and Successfully,

Guy Reiff
Project Director

NATIONAL YOUTH FITNESS SURVEY

AGENDA

1. Introduction of Personnel

   A. Importance of study/meeting

   B. Contribution of Participants/Testers

2. General Objectives of Meeting; to:

   A. Explain test administration; test history

   B. Sampling procedures

   C. Data Collection, Recording, Transmission

   D. Travel Expenses

3. Rationale for Fitness Studies

   A. Brief history of AAHPERD/President's Council Test; original and previous test items

   B. Specific details of sampling procedures; Test Modules

      a. sample size and scope

      b. probability of district selections

   C. Changes/Modifications in 1985 test; Rationale for changes/modifications

      a. 600 yard run/mile run

      b. pull-ups/flexed arm hang, girls, boys

      c. flexibility

      d. 1 mile walk

4. Review Administration of Tests

5. Distribute Data Packets

   A. Use of data cards, recording, etc.

   B. Mailing Procedures

6. Travel Vouchers

7. Adjournment

NATIONAL PHYSICAL FITNESS STUDY:YOUTH FITNESS PROJEC
Division of Physical Education
CCF
The University of Michig
Ann Arbor, Michigan 48109

Guy Reiff, Ph.D.
Director
University of Michigan
(313) 764-4472

W.R. Dixon, Ph.D.
Associate Director
University of Michigan

Christine Spain
Project Officer
President's Council on
Physical Fitness and Sports

Ashley H yes, Ed.D.
Acting Executive Director
President's Council on
Physical Fitness and Sports

The Late
Paul A. Hunsicker, Ph.D.
University of Michigan
Study Director 1958, '65,'75

Diane Jacoby
Administrative Assistant
University of Michigan

Geor,e Allen
Chairman
President s Council on
Physical Fitness and Sports

June 5, 1986

Dear Colleagues:

Once again I would like to thank you for your dedicatior and cooperation in the data collection for the 1985 National Fitness and Sports. This study is now complete and will be published this summer or fall.

We have made some substitutions in our original ideas about expressing our gratitude to you. By this time, or soon, you will be receiving an Instructor's patch and letter from the President's Council as a special "thank you" for a job well done. We substituted the patch for the promised certificate because we thought you would enjoy it more and could use it on your warm-up suits everyday. You will also be receiving a copy of the new norms we promised you.

Enclosed you will find a special remembrance from our staff, Diane Jacoby, Dr. W.R. Dixon, Guo Xiong Ye, and me. This is called the "Super Letter Slitter" and is something you can use each day. We hope you will keep it for many years as a souvenir which reminds you of your important part in the largest study of physical fitness ever conducted in this country.

Once again, thank you! We'll look forward to seeing you again at conventions, meetings, etc. Should you visit Ann Arbor someday, be sure to look us up! All best wishes from all of us.

Positively and Successfully,

Guy G. Reiff, Ph.D.
Professor

GGR:mm

ISR

SURVEY RESEARCH CENTER / INSTITUTE FOR SOCIAL RESEARCH / THE UNIVERSITY OF MICHIGAN
ANN ARBOR, MICHIGAN 48106-1248

TO: Guy Reiff, UM Physical Education Department
SUBJECT: Sample design to accomodate a 9-event battery of tests to establish fitness norms for American youth
FROM: Steve Heeringa, Sampling Section, ISR
DATE: 18 December 1984

I. Sample design requirements

The objective of this sample-based data collection is to establish age-specific norms for each of nine independent fitness events:

1. Sit-ups
2. Pull-ups
3. Extended arm hang
4. Fifty yard dash
5. Standing long jump
6. Shuttle run
7. Flexibility test
8. One mile run/walk
9. Two mile walk.

The "norms" will be established by estimating the decile points of the national cumulative distribution of performances for each fitness event. The decile statistics will be estimated separately for boys and girls in each elementary and secondary school age class (12 age classes).

II. Multi-stage design

The sample of students to be tested is based on a multi-stage design. The primary stage sample consists of the 45 U.S. SMSA's and counties which comprise the "C" half sample of the Survey Research Center's 1980 National Sample design.

Within this primary stage sample of SMSA's and counties, 50 second stage selections consisting of 60 independent public school districts have been sampled. Typically, one district has been selected per primary area. One form of exeption to this one district per area rule occurs in the large, self-representing primary areas (e.g. New York, NY SMSA and Chicago, IL SMSA). Due to the larger than average student population in these self-representing areas (certainty strata), multiple district selections have been made. Other exceptions include: primary areas where several small districts are linked to form a selection with a minimum estimated enrollment of 1500 students; and primary areas where elementary and secondary schools are divided into separate districts for administrative purposes.

From each second stage selection (district or district combination), an average of 3.85 schools (4 in some, 3 in others) will be selected for the testing phase of the study. In all, approximately 180 schools will be selected in the third stage of sampling. Within a sample school, a subsample of approximately 4 classes (homerooms or physical education classes) will participate in the assigned battery of test events. Assuming an average of 25 students/ class, the total number of students to be tested is:

	50	selections (1-12 grade district equivalent)
x	3.85	schools per district selection (average take)
x	4	classes per school (average take)
x	25	students per class
	19,200	students tested (See Section III.)

Over the multiple stages of the design, the sampling procedure will guarantee each U.S. public school student an equal probability of being tested. (Since age cohorts are not exactly equal in size, sampling rates will be adjusted slightly to insure the proper sample allocation for each student age class.) Assuming a U.S. public school enrollment (grades 1-12) of approximately 41,000,000 students, the probability that a student will be tested is roughly 19,200/41,000,000=.00047=1/2135.

III. Special sampling procedures

Problem

In previous surveys, fitness norms were established for a battery of seven tests. (Actually six since boys were tested on pull-ups and girls were tested on the extended arm hang.) For the current study, the proposal is to augment the original series of tests. Boys and girls will both participate in pull-up and extended arm hang testing. In addition, both boys and girls will be tested in the two mile walk and in a basic flexibility event.

While the nine test battery will provide valuable new fitness norms for young people, it does raise several problems in the testing process. First, past experience suggests that a 6-7 test battery already poses some burden for instructors and students. To ask each student to participate in nine separate events could negatively affect response rates at both the school and student levels. Secondly, even if the test in load is reduced to 5-7 events per student, some schools may feel that they cannot ask a student to participate in both the one mile run and the two mile walk events.

Proposed solution to the problem

Given experience which suggests that 5-7 events/student is a practical testing load, we could consider the following procedure for allocating test events to sample students. First, divide the nine designated events into three subsets or test "modules". For the sake of discussion, we can use the modules that you identified in our last conversation:

Module Events

A One mile run/walk (*) Standing long jump Flexed arm hang

B Pull-ups Fifty yard dash Shuttle run

C Two mile walk (*) Flexibility test Sit-ups (*) optional porocedure described below

When the sample of classrooms has been selected, each class will be randomly assigned a pair of test modules to complete. Random assignments will be controlled to insure proper balance in the pairing of the test modules. The number of possible pairs of test modules (three choose two permutations) is three:

Pair	Classes	Students
A B	256 (33%)	6400
A C	256 (33%)	6400
B C	256 (33%)	6400

Looking singly at each module:

Module	Classes	Students
A	512	12800
B	512	12800
C	512	12800

12,800 students will participate in each module.

The proposed approach requires testing of 19,200 students. At the completion of the testing, 12,800 students will be tested in each event--1070 students per event in each of twelve age classes (See below for exceptions in the one mile run/walk and two mile walk events). Furthermore, fielding each of three possible pairings of the test modules will permit us to estimate the correlation in scores between all possible pairs of the nine test

events. For example, the score correlation between module A and B events can be estimated from data for 6400 students (533 students in each age range).

The plan outlined in the preceding paragraph does not address the fact that classes which are assigned the A,C module pair are being asked to complete both the one mile run/walk and the two mile walk events. In the event that a school is unwilling to complete both running/walking events, we could consider the following approach. School classes assigned to the A,C module pair would initially be asked to complete both the one mile run and the two mile walk. If resist doing both, they will then be permitted to drop one of the two events from. However, for this option to be unbiased, we will need to randomly designate in advance which of the two events would be dropped from the A,C test battery. The school should not know which event will be dropped before it makes the decision to do one or two events.

If all school classes in the A,C test battery choose the randomized one test option, the number of sample observations for the one mile run/walk and the two mile walk events would fall to a minimum of 800 students per grade (9600 total tests per event). At 800 students per grade, we would still obtain acceptable precision levels when estimating the norms for these two events. Most likely, a fair number of schools will elect to conduct both run/walk events. This being the case, the number of one mile run and two mile walk tests would range upward from the 9600 minimum to a maximum of 12,800 observations (if all classes assigned the A,C module agreed to test in both events). Equally important, we would obtain a random sample of one mile run/two mile walk observation pairs which would permit us to measure the correlation between scores for these two events.

YOUTH FITNESS PROJECT

Rationale

Modification of AAHPERD Test. This will be the first national test to provide performance data for boys/girls, grades 1 through 4, as well as grades 5 through 12. We have added a flexed arm hang for boys and pull-ups for girls, and a mile run/walk.

1. Test Modifications. This test will differ slightly from previous batteries. The "standard" tests, 50 yard dash, shuttle run, standing long jump, and pull-ups (boys) flexed arm hang (girls) will remain the same. For the first time, due to many requests, we are adding pull-ups for girls and flexed arm hang for boys. Thus we will have identical data for each sex and also avoid deferential treatment.

   We have added several new tests: (1) Flexibility (sit/reach) which requires only a yardstick; (2) a mile run/walk (replacing the 600 yard dash); and (3) a two-mile walk. These tests will enable teachers to choose all or any combinations of tests and present national data never before available.

2. Sample Design. The primary objective is to establish sex and age-specific norms for each of nine independent fitness events:

   1. Sit-ups
   2. Pull-ups
   3. Flexed arm hang
   4. Fifty yard dash
   5. Standing long jump
   6. Shuttle run
   7. Flexibility test
   8. One mile run/walk
   9. Two mile walk

   Norms will be established by estimating each fifth percentile point for each fitness event by age and by sex.

3. School Responsibility. Naturally, asking each school to conduct nine tests could be too great a work load. We have designed the sample so that no school will be asked for more than six tests (the same as in all previous studies). We expect to select a maximum of only 3 or 4 classrooms per school and 2-3 schools per district. The assignment of tests for each school will be randomized in such a way that no school will be asked to test both the mile run/walk and the two mile walk. Pilot studies have disclosed that from 2-3 class periods should suffice to complete each school's assigned test battery.

   A test packet containing data cards and an addressed, stamped return envelope will be provided for each school classroom. Instructors record test results on these cards, staple shut the "jiffy bag" return envelopes

and drop into a convenient mail box.

We plan on testing during April, May and June, 1985.

4. Orientation of School Personnel. Where feasible, we intend to conduct regional clinics for physical education supervisory personnel and superintendents/principals. Where geographic location of some districts does not readily lend itself to a clinic the Project Director will visit these districts for the orientation clinic session. These meetings will be scheduled quickly -- within the next one to three weeks! Each of the supervisors will then orient their personnel in test schools to administer the battery. Test packets for each school and classroom will be distributed at the orientation session.

   If additional testing personnel are needed we will provide them from the project staff. We plan to hold clinics on a Saturday 10-12 a.m. and 1-3 p.m.

5. Costs. Costs for clinics. i.e., all transportation, meals and lodging will be paid by the project. Local meeting costs, such as meeting site and other miscellaneous expenses, will be paid by the project.

   Any other incidental costs for data collection, etc., can be negotiated with the Project Director.

6. Benefits and Liabilities. This is a rine opportunity for you and your school to become a key part of a vital, high-exposure, and useful national project. In addition, there are a number of personal benefits and satisfactions for partipating personnel. Without the cooperation of physical education teachers everywhere the three previous studies could not have been completed.

Benefits	Liabilities
1. A beautiful "Certificate of Merit" for each person involved in the ess project from the President's il on Physical Fitness and Sports. l suggest that your school board ent these awards to you.	1. Some extra personnel time in recording and checking data cards.
2. Names of all personnel listed by school, district, and state in the new AAHPERD Physical Fitness Manual (This, of course, is optional).	2. Administrative problems, where applicable, in testing homerooms
3. A news release ready for publication for radio, TV, newapapers stating the nature of the project, the	3. Some interruption of regularly scheduled class activities.

Benefits	Liabilities

3. (Continued)

   participating personnel, and identifying your school and district as an important test site for these national data.

4. A professional opportunity to participate in an important national research project and to contribute data which will be utilized by thousands of school children in the United States and foreign countries.

5. Opportunity to meet with and exchange ideas and viewpoints with other professionals.

6. A 1984-85 AAHPERD test manual for each school when published.

7. Students have the opportunity to participate in a nationwide testing project and establish new norms.

8. A personal letter to each school from the President's Council on Physical Fitness and Sports acknowledging their participation.

9. A personal, useful "desk top" gift from the Project Director.

PLEASE CALL US COLLECT AT 1-(313) 764-4472 AS SOON AS POSSIBLE. WE HOPE YOU WILL PARTICIPATE AND THAT WE WILL MEET YOU PERSONALLY VERY SOON! THANK YOU, WE'LL LOOK FORWARD TO HEARING FROM YOU.

YOUTH FITNESS PROJECT
401 Washtenaw Ave.
The University of Michigan
Ann Arbor, Michigan 48109

Dear Colleague:

Enclosed is a prepared press and radio news release for you to use at your discretion. Note that space is left to identify the schools in the sample, and that space is also provided for the personnel you wish to identify. Many districts have sent the release to television, newspaper and radio outlets. Thank you again for your participation in this project. I look forward to hearing from you soon. All best wishes,

Positively and Successfully,

Guy Reiff

Guy Reiff
Project Director

GR/mh
Enclosure

NEWS RELEASE

For Immediate Release
February/March 1985

Reading Time: 1 1/2 mins.

Additional information available from Guy G. Reiff, Ph.D., The University of Michigan, (313) 764-4472.

How physically fit are your children? Studies of the fitness of American school children have consistently reported that our youth have scored poorly on both physical performance and "health related" tests such as skinfold fat. In 1980 the Surgeon General of the United States declared that "...the fitness of our youth is a national tragedy."

Our children seem to be getting fatter and less prone to engaging in vigorous exercise. Most children are not achieving the fitness skills required to promote good health and fitness.

A nationwide study of the physical fitness of 18,000 public school children, grades 1 through 12, is currently being funded by The President's Council on Physical Fitness. The physical fitness study will encompass the 1984-85 school year.

The _____ school district
(school name)
has been selected as one of the test sites for this research. Local School personnel selected as test administrators are:

_____ (Name), _____ (School or Title);
_____ (Name), _____ (School or Title);
_____ (Name), _____ (School or Title);
_____ (Name), _____ (School or Title);
_____ (Name), _____ (School or Title);

This is the first time that children from grades 1 through 4 will be

tested nationwide. Nine fitness tests (no more than six from each school will be administered. These are: (1) One mile run/walk (cardiovascular endurance; (2) two mile walk (cardiovascular endurance); (3) pull-ups (dynamic upper arm strength); (4) flexed arm hang (static upper arm strength); (5) sit-ups (abdominal strength); (6) shuttle run (agility/ quickness); (7) standing long jump (explosive ability); (8) sit and reach (flexibility); and (9) 50-yard dash (speed). Each school will test slightly different versions of the battery so that no school will do more than six tests. Also, no school will be asked to test both the 2 mile walk and the one mile run/walk.

This is the fourth national fitness test using similar or identical test items. Each has been conducted by personnel from the University of Michigan in 1958, 1965, and 1975. The 1958 studies reported that children scored poorly on all events. Dramatic improvement, but still considered poor to fair, was found in 1965. Little or no gains were disclosed in 1975, although there was some improvement in running times in some of the girls' age groups. These, however, were not statistically significant.

YOUTH FITNESS PROJECT
401 Washtenaw Ave.
The University of Michigan
Ann Arbor, Michigan 48109

Dear Principal:

Thank you for your prompt and positive response to our request for your cooperation in the 1984-85 National Study of Youth Fitness. Your superintendent has informed us that your school district will cooperate in this research. We are looking forward to working with you and your staff soon.

We have devised a simple method for selecting with equal probability students in the grades 1-12 which your school contains. To do this efficiently, we need a list of all "classrooms" (grades 1-12) from which we will select a few classrooms. The students in these classes selected will constitute the sample of students from your school. Only 3-4 classrooms per school will be selected.

The list of classrooms for our use must be such that each student (grades 1-12) is associated with one and only one of these classes.

We shall follow any system of identification that your school uses. Most schools use "homerooms" for this purpose. Some schools use the second period, or period in which attendance is taken, announcements read, etc. If your system of identification is different from these examples please describe it on the form provided.

If physical education is REQUIRED, please list those classes for the appropriate grades We will sample from physical education classes in this case.

WE ASK YOUR KIND COOPERATION FOR THE FOLLOWING:

1. LIST ALL "CLASSROOMS" IN ANY OF THE GRADES 1 THROUGH 12 IN YOUR SCHOOL. Identify (in Col. 2) each "classroom" by whatever method you use in your school; i.e., homerooms, section number, teacher, etc.

2. Place a check in Col. 3 for each class that contains from 20-40 students. If class size does not fall between 20-40 students, please indicate size in Col. 4.

3. A photocopy, or other list of classes is fine. Just staple it to the form and send it along. Please be sure that grade and subject are identified on your list if you choose this option!!

4. PLEASE RETURN THE COMPLETED LIST at your earliest convenience -- preferably within a few days. We enclose a return envelope.

Thank you again for your cooperation. We'll look forward to hearing from you soon.

Positively and Successfully,

Guy Reiff
Project Director

Enclosure

YOUTH FITNESS STUDY
CLASSROOM LISTING

1. Principal: _____ 2. Telephone ( ) _____

3. School District: _____ 4. School Name: _____

5. School Address: _____

6. Physical Education Required in Grades (Circle): 1 2 3 4 5 6 7 8 9 10 11 12

7. Physical Education Elective in Grades (Circle): 1 2 3 4 5 6 7 8 9 10 11 12

8. Physical Education Class Time: ____45 min. to 1 hr. ____1/2 hr. ____Other.

Days/Week: ____1 ____2 ____3 ____4 ____5 ____Other.

Any Comment: _____

(1) Grade of classroom 1 through 12.	(2) Classroom Identification (each classroom identified by whatever system used: Homeroom, section, teacher, etc.)	(3) Check this column if class size is from 20-40.	(4) If class size is not 20-40, write size in this column.	(5) Notes or comments (all boys, all girls, etc.)

BOYS DATA CARD
Module B/C

NATIONAL YOUTH FITNESS SURVEY

FOR OFFICE USE ONLY:

School Name: _____

School District: _____

State: _____ PSU I.D.: _____ School I.D. _____ Classroom I.D. _____

I.D. # (Office Use)	NAME (Last First)	GRADE	BIRTHDATE Mo/Day/Yr	HT. In.	WT. Lbs.	PULL-UPS Min/Sec.	50 YD. Secs.	SHUTTLE RUN Secs.	2 MILE Min/Sec.	FLEXI-BILITY Inches	SIT-UPS No.	

94

APPENDIX F

Dictionary for Youth Fitness Study

JUL 8, 1986 NYFS.DICT--DICTIONARY FOR YOUTH FITNESS STUDY

VAR#	VARIABLE NAME	GROUP	COL	WIDTH	NDEC	TYPE	MDCODE1	MDCODE2	RESP	REFNO	ID
V1	MODULE	0	1	1	0	A			1	1	
V2	PSU	0	2	4	0	C	0	9999	1	2	
V3	DISTRICT	0	6	1	0	C	0	9	1	3	
V4	SCHOOL	0	7	3	0	C	0	999	1	4	
V5	CLASS	0	10	2	0	C	0	99	1	5	
V6	CLASS ID	0	12	6	0	C	0	999999	1	6	
V7	GRADE	0	18	2	0	C	0	99	1	7	
V8	BIRTH MONTH	0	20	2	0	C	0	99	1	8	
V9	BIRTH DAY	0	22	2	0	C	0	99	1	9	
V10	BIRTH YEAR	0	24	2	0	C	0	99	1	10	
V11	HEIGHT	0	26	3	1	C	0	999	1	11	
V12	WEIGHT	0	29	4	1	C	0	9999	1	12	
V13	MILE RUN-MINUTES	0	33	2	0	C	0	99	1	13	
V14	MILE RUN-SECONDS	0	35	2	0	C	0	99	1	14	
V15	LONG JUMP-FEET	0	37	2	0	C	0	99	1	15	
V16	LONG JUMP-INCHES	0	39	2	0	C	0	99	1	16	
V17	FLEX ARM HANG	0	41	3	0	C		999	1	17	
V18	PULL-UPS	0	44	2	0	C		99	1	18	
V19	50-YARD DASH	0	46	3	1	C	0	999	1	19	
V20	SHUTTLE RUN	0	49	3	1	C	0	999	1	20	
V21	2 MILE WALK-MINUTES	0	52	2	0	C	0	99	1	21	
V22	2 MILE WALK-SECONDS	0	54	2	0	C	0	99	1	22	
V23	SIT & REACH	0	56	4	1	C		9999	1	23	
V24	SIT-UPS	0	60	2	0	C		99	1	24	
V25	SEX	0	62	1	0	C	0	9	1	25	
V26	TEST PHASE	0	63	1	0	C			1	26	
V27	AGE	0	64	2	0	C	0	99	1	27	
V28	MILE RUN-SECONDS	0	66	4	0	C	0	9999	1	28	
V29	LONG JUMP-INCHES	0	70	4	0	C	0	9999	1	29	
V30	2 MILE WALK-SECONDS	0	74	4	0	C	0	9999	1	30	

SELECTED REFERENCES

1 American Alliance for Health, Physical Education, Recreation and Dance *Health Related Physical Fitness Test*, 1981

2. Blumenthal, S , et al , "Risk factors for coronary artery disease in children of affected families " *The Journal of Ped.*, 87 (6).1187-1192, 1975

3. Bonanno, J. and J.E. Lies. "Effects of physical training on coronary risk factors " *The Amer. Journ of Card.*, 33:760-764, 1974

4. Campbell, W.R. and R. Pohndorff. "Physical Fitness of British and U S Children " *Health and Fitness in the Modern World*, a Collection of Papers Presented at the Institute of Normal Human Anatomy, Rome, Italy, 1960.

5 Clarke, R P , *et al.*, "Interrelationships between plasma lipids, physical measurements, and body fatness of adolescents in Burlington, Vermont," *Amer. J Clin Nutr.*, 23 754-763, 1970

6 Committee on Pediatric Aspects of Physical Fitness, Recreation, and Sports "Fitness in the preschool child " *Pediatrics*, 58(1):788-89, 1976

7 Ekblom, B "Effect of physical training in adolescent boys," *J of Appl Physiol.*, 27(3) 350-55, 1969

8 Erikkson, B O. "Physical training, oxygen supply and muscle metabolism in 11-13 year old boys," *Acta. Physiol. Scand.*, 384 (Suppl) 1972.

9. Frederichs, R., *et al.*, "Serum cholesterol and triglyceride levels in 3,466 children from a biracial community, The Bogalusa Heart Study," *Circulation*, 54(2) 302-09, 1976

10 Friedman, G.M "A pediatrician looks at risk factors in atherosclerotic heart disease " *Clin Rev.* 20:250-52, 1972.

11 Fleishman, E *The Structure and Measurement of Physical Fitness*, (Englewood Cliffs, N J Prentice Hall) 1964.

12 Fleishman, E *The Dimension of Physical Fitness - The Nationwide Normative and Developmental Study of Basic Tests.* Office of Naval Research, Contract 609(32), 1962

13 Gilliam, T.B , V L Katch, W G Thorland, S Sady "Prevalence of coronary heart disease risk factors in active children 7 to 12 years of age," *Med Sci Sports*, 9(1), 21-25 (1977)

14 Gilliam, T B and M.B Burke "Effects of exercise on serum lipids and lipoproteins in girls, ages 8-10 years " *Artery* 4(2) 203-13, 1978

15 Gilliam, T B and P.S Freedson "Effects of a 12-week school physical fitness program on exercise performance, body composition and blood lipids in 7-9 year old children " *Int J Sports Med*, 1(2) 73-78, 1980

16 Gilliam, T B , V L Katch, W G. Thorland and A L Weltman "Prevalence of coronary heart disease risk factors in active children, 7 to 12 years of age," *Med. Sci. Sports*, 9(1) 21-25, 1977

17. Healthy People The Surgeon General's Report on Health Promotion and Disease Prevention (U S Dept of Health Education and Welfare, DHEW (PHS), Pub #79-55071, 1979

18 Hunsicker, P *Physical Fitness.* American Educational Research Series, *What Research Says.* No 26, 1963

19 Hunsicker, P "National norms for fitness " Report of the 7th National Conference on Physicians and Schools Chicago American Medical Association, 1959

20 Hunsicker, P and G Reiff "Comparison of youth fitness, 1958-65 " Cooperative Research Project No 2418 (U S Office of Education Washington, D C)

21 Hunsicker, P and G Reiff "Comparison of youth fitness, 1958-65-75 " Research Contract #OEC-0-74-9332 (U S Office of Education, Washington, D C), in preparation, 1986

22. Hunsicker, P and G Reiff *Youth Fitness Test Manual* (AAHPERD Washington, D C), 1965

23 Hunsicker, P. and G Reiff *Youth Fitness Test Manual* (AAHPERD Washington, D C), 1975

24 Kannel, W B , and T R Dawber "Atherosclerosis as a pediatric problem," *J Pediatrics*, 80 544-54, 1972

25 Kish, L. *Survey Sampling.* (New York Wiley and Sons), 1965

26 Kraus, H , and R Hirschland "Muscular Fitness and Health," *JOHPER* 24 10-17, May, 1954

27 Kraus, H and B. Prudden "Minimum Muscular Fitness in School Children " *Res Quart* 25 178-88, May, 1954

28 Lauer, R M *et al.*, "Coronary heart disease risk factors in school children The Muscative study " *J Pediatrics*, 86 697-706, 1975

29 Marmot, M G Epidemiological basis for the prevention of coronary heart disease *WHO.* 57(3) 331-347, 1979

30 Mayer, J *Overweight: Causes, Cost, and Control.* (Englewood Cliffs, N J , Prentice-hall, Inc), 1964

31 Moffat, R J and T G Gilliam "Serum lipids and lipoproteins as affected by exercise A review " *Artery*, 6 1-49, 1979

32 National Adult Physical Fitness Survey Newsletter of the President's Council on Physical Fitness and Sports, May 14, 1973

33 National Center for Health Statistics "NCHA Growth Charts, 1976 " Monthly Vital Statistics Reports Vol. 25, No 3 Suppl (HRA 76-1120), Rockville, MD, 1976

34. Parizkova, J "Particularities of lean body mass and fat development in growing boys as related to their motor activity," *Acta. Paediatrica Belgica*, 28 233-244, (Suppl), 1974

35 Reiff, G "Physical fitness guidelines for school aged youth " *Proceedings of the First National Conference on Physical Fitness and Sports for All* (U S Government Printing Office Washington, D C), 1981.

36 Reiff, G , N Montoye, R Remington, J Napier, H Metzner, F Epstein, "Assessment of Physical Activity by Questionnaire and Interview " *The Journ of Spts. Med and Phys Fit* , Vol 7, Sept 1967, pp 135-42.

37. Reiff, G., L Kish, J Harter "Selection of a Probability Sample of School Children in the Coterminous United States" *Res. Quart.* Sept., 1967

38 Ross, James G and Gilbert, Glen G "The National Children and Youth Fitness Study" *Journal of Health, Physical Education, Recreation, Dance*, January, 1985

39 Safrit, M J *Evaluation in Physical Education Assessing Motor Behavior* (Englewood Cliffs Prentice Hall), 1973

40 Sady, D W "Total daily energy expenditure of health of free ranging school children" *Am J Clin Nutr.*, 33 766-775, 1980

41 Thorland, W G and T B Gilliam "Comparison of serum lipids between habitually high and low active pre-adolescent males" *Medicine and Science in Sports and Exercise*, Vol 13, No 5, 1981

42. Strong, W B Is atherosclerosis a pediatric problem? an overview in *Atherosclerosis Its Pediatric Aspects* W B Strong (Ed), New York Gene and Stratton, Inc , 1978, pp 1-14

43 Updyke, Wynn F "Profile Reveals Fitness Levels Lower than Desirable," *Stress*, July, 1982

44 Wilmore, J H and J J McNamara "Prevalence of coronary heart disease risk factors in boys, 8 to 12 years of age," *J. of Pediat* , 84 527-533, 1974